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CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

Vol. VII.

SYSTEMATIC AND GEOGRAPHIC BOTANY, AND ABORIGINAL USES OF PLANTS.

Monograph of the North American Umbelliferae.
The Origin and Distribution of the Cocoa Palm.
Plants Used by the Indians of Mendocino County, California.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900–1902.

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NOTE.

The three numbers of Volume VII of the Contributions were published as follows:

- No. 1, pp. 9 to 256, December 31, 1900.
- No. 2, pp. 257 to 293, September 24, 1901.
- No. 3, pp. 295 to 408, January 24, 1902.

Pages 1 to 8, and 409 to 422 were issued August 23, 1902.

PREFATORY NOTE.

In the act of Congress making appropriation for the Department of Agriculture for the fiscal year ending June 30, 1889, provision was made for botanical exploration and the collecting of plants in little-known districts of America, in connection with the United States National Herbarium, and in the appropriation for 1891 additional provision was made for the publication of reports. Since those years similar provisions have been made annually. As a partial result of these appropriations, the Department has issued heretofore six completed volumes of a series of publications entitled Contributions from the United States National Herbarium. To these the seventh volume is now added.

Through a special provision in the last sundry civil appropriation act the publication of the Contributions will be transferred on July 1, 1902, to the United States National Museum. Subsequent volumes will therefore be issued from that institution.

Frederick V. Coville,
Botanist, U. S. Department of Agriculture,
Curator, U. S. National Herbarium.

Washington, *June 27, 1902.*

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U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

Vol. VII, No. 1.

ISSUED DECEMBER 31, 1900.

MONOGRAPH OF THE NORTH AMERICAN UMBELLIFERAE.

BY

JOHN M. COULTER and J. N. ROSE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Division of Botany,
Washington, D. C., August 16, 1900.

Sir: I have the honor to transmit herewith and to recommend for publication as Contributions from the United States National Herbarium Volume VII, No. 1, a manuscript by John M. Coulter and J. N. Rose, entitled "Monograph of the North American Umbelliferae."

Respectfully,

Frederick V. Coville,
Botanist.

Hon. James Wilson,
Secretary of Agriculture.

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MONOGRAPH OF THE NORTH AMERICAN UMBELLIFERAE.[1]

By John M. Coulter and J. N. Rose.

INTRODUCTION.

In 1888 we published the Revision of North American Umbelliferae.[2] This was the first general presentation of the North American species since Torrey and Gray's account of the family in the Flora of North America, which appeared in 1840. In the twelve years which have elapsed the work of botanical exploration has proceeded with remarkable activity, and the additional material which has come into our hands has far exceeded all expectation. Since the appearance of the Revision descriptions of numerous new species and genera have appeared in various publications. The adjacent floras of Mexico and Central America have also yielded an enormous return for diligent exploration, and their rich display of Umbelliferae has helped to a better understanding of our own species. In the meantime conceptions of genera and species have been shifting in the direction of a more exact definition of forms, and especially has the idea of the importance of an exact knowledge concerning types and type localities developed. To crown all of this the monograph of the genera of Umbelliferae by Drude, in Engler and Prantl's Natuerlichen Pflanzenfamilien, appeared in 1898, which defined the genera and indicated their relationships with a completeness which had never been attained before. In consideration of all of these facts the time seemed ripe to us for a new presentation of our North American species. For convenience of reference, rather than for any special appropriateness in the name, we have decided to call this a Monograph rather than a second Revision.

In the preface to our former revision there is given a list of the publications containing descriptions of new species since Torrey and Gray's Flora. This list, with certain corrections and omissions, is here reproduced. Works in which new names only occur are also included.

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[1] Although we have used the name Umbelliferae for this family throughout this work, yet it is proper to state that the name Apiaceae has been adopted by a number of American botanists, and has so appeared in several numbers of the Contributions.

[2] Coulter, John M., and Rose, J. N. Revision of North American Umbelliferae. Crawfordsville, Indiana. December, 1888. Pp. 1-144, pls. 1-9.

This list is here preceded by a condensed bibliography of all the works from Linnaeus's Species Plantarum to Torrey and Gray's Flora, which contain new names or new descriptions of Umbelliferae included in our range. Following these two lists will be found a similar list of publications containing new species and new names published since the Revision and before the present Monograph.

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CYRILLI, D.: Pl. Rar. Neap. fasc. 2 (1792), 1 sp.
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HOFFMANN, G. F.: Gen. Pl. Umbell. (1814), 1 sp.; ed. 2 (1816), no species.
NUTTALL, T.: Gen. vol. 1 (1818), 13 spp.
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HITCHCOCK, A. S.: Trans. St. Louis Acad. vol. 5 (1891), 1 sp.

JONES, M. E.: Zoe, vols. 2 (1891), 3 and 4 (1893), 6 spp.; Proc. Cal. Acad. ser. II, vol. 5 (1895), 6 spp.; Contr. Western Bot. no. 8 (1898), 7 spp.

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DRUDE, O.: Engler and Prantl's Nat. Pflanzenfam. vol. 3, pt. 8 (1898), 2 spp.

EASTWOOD, Miss A.: Proc. Cal. Acad. Sci. ser. III, vol. 1 (1898), 1 sp.

HOWELL, THOMAS: Fl. N. W. Am. vol. 1 (1898), 2 spp.

NELSON, A.: Bull. Torr. Bot. Club, vols. 25 (1898) and 26 (1899), 3 spp.

PIPER, C. V.: Erythea, vol. 6 (1898), 1 sp.

HENDERSON, L. F.: Contr. Nat. Herb. vol. 5 (1899), 1 sp.

CONGDON, J. W.: Erythea, vol. 7 (1900), 1 sp.

The total number of new species and names appearing in the last list is 109. The new genera (4) and species or subspecies (68) which appeared in the publications cited in the same list are as follow, the name appearing in every case as originally published:

NEW GENERA.

Hesperogenia C. & R.
Leibergia C. & R.
Taenidia Drude.
Taeniopleurum C. & R.

NEW SPECIES.

Angelica ampla A. Nelson.
Angelica californica Jepson.
Angelica roseana Henderson.
Carum lemmoni C. & R.
Cicuta occidentalis Greene.
Cicuta purpurata Greene.
Cicuta vagans Greene.
Cymopterus bulbosus A. Nelson.
Cymopterus calcareus Jones.
Cymopterus decipiens Jones.
Cymopterus ibapensis Jones.
Cymopterus megacephalus Jones.
Cymopterus newberryi alatus Jones.
Cymopterus montanus pedunculatus Jones.
Cymopterus panamintensis C. & R.
Cymopterus petraeus Jones.
Cymopterus utahensis Jones.
Cymopterus utahensis eastwoodae Jones.
Cymopterus utahensis monocephalus Jones.
Eryngium alismaefolium Greene.
Eryngium aristulatum Jepson.
Eryngium lemmoni C. & R.
Eryngium sparganophyllum Hemsl.
Eulophus parishii rusbyi C. & R.
Hesperogenia stricklandi C. & R.
Hydrocotyle bonariensis texana C. & R.
Leibergia orogenioides C. & R.
Leptotaenia californica platycarpa Jepson.
Leptotaenia californica dilatata Jepson.
Leptotaenia minor Rose.
Ligusticum eastwoodæ C. & R.
Ligusticum goldmani C. & R.
Ligusticum macounii C. & R.
Lilaeopsis carolinensis C. & R.
Lilaeopsis occidentalis C. & R.
Musineon vaginatum Rydberg.
Peucedanum argense Jones.
Peucedanum confusum Piper.
Peucedanum erosum Jepson.
Peucedanum evittatum C. & R.
Peucedanum gormani Howell.
Peucedanum hassei C. & R.
Peucedanum insulare Eastwood.
Peucedanum juniperinum Jones.
Peucedanum lapidosum Jones.
Peucedanum lemmoni C. & R.
Peucedanum megarrhiza A. Nelson.
Peucedanum nevadense cupulatum Jones.
Peucedanum plummerae C. & R.
Peucedanum robustum Jepson.
Peucedanum salmoniflorum C. & R.
Peucedanum scopulorum Jones.
Peucedanum torreyi C. & R.
Peucedanum triternatum robustius C. & R.
Sanicula divaricata Greene.
Sanicula floridana Bicknell.
Sanicula gregaria Bicknell.
Sanicula nemoralis Greene.
Sanicula saxatilis Greene.
Sanicula septentrionalis Greene.
Sanicula smallii Bicknell.
Sanicula trifoliata Bicknell.
Selinum eryngiifolium Greene.
Selinum validum Congdon.
Sium heterophyllum Greene.
Velaea arguta ternata C. &. R.
Velaea glauca C. & R.
Washingtonia divaricata Britton.
Washingtonia intermedia Rydberg.

The new names or new combinations (40) which have appeared since our Revision, in 1888, are as follows:

Adorium lucidum Kuntze, Rev. Gen. Pl. **1**: 264. 1891.
Anidrum americanum Kuntze, Rev. Gen. Pl. **1**: 264. 1891.
Archangelica villosa Kuntze, Rev. Gen. Pl. **1**: 265. 1891.
Ataenia howellii Greene, Pittonia **1**: 274. 1889.
Ataenia kelloggii Greene, Pittonia **1**: 274. 1889.
Ataenia oregana Greene, Pittonia **1**: 274. 1889.
Berula erecta Coville, Contr. Nat. Herb. **4**: 115. 1893.
Conioselinum bipinnatum Britton, Bull. Torr. Bot. Club, **14**: 233. 1887.
Cymopterus acaulis Rydberg, Bot. Surv. Nebr. **3**: 38. 1894.
Cymopterus lapidosus Jones, Contr. Western Botany no. 8: 31. 1898.
Cymopterus newberryi Jones, Zoe **4**: 47. 1893.
Cymopterus newberryi jonesii Jones, Proc. Cal. Acad. ser. II, **5**: 684. 1895.
Cymopterus parryi Jones, Zoe **4**: 48. 1893.
Deringa canadensis Kuntze, Rev. Gen. Pl. **1**: 266. 1891.
Hallomuellera lineata Kuntze, Rev. Gen. Pl. **1**: 267. 1891.
Ligusticum canadense Britton, Mem. Torr. Club, **5**: 240. 1894.
Lilaeopsis lineata Greene, Pittonia **2**: 192. 1891.
Lilaeopsis schaffneriana C. & R. Bot. Gaz. **24**: 48. 1897.
Musineon divaricatum C. & R., Bot. Gaz. **20**: 259. 1895.
Myrrhis nuda Greene, Man. Bot. Bay Reg. 157. 1894.
Oxypolis fendleri Heller, Bull. Torr. Bot. Club **24**: 478. 1897.
Oxypolis filiformis Britton, Mem. Torr. Club **5**: 239. 1894.
Oxypolis rigidior longifolia Britton, Mem. Torr. Club **5**: 239. 1894.
Oxypolis ternata Heller, Cat. N. Am. Pl. 5. 1898.
Ptilimnium laciniatum Kuntze, Rev. Gen. Pl. **1**: 269. 1891.
Ptilimnium nuttallii Britton, Mem. Torr. Club **5**: 244. 1894.
Sanicula canadensis marylandica Hitchcock, Trans. St. Louis Acad. **5**: 497. 1891.
Spermolepis divaricatus Britton, Mem. Torr. Club **5**: 244. 1894.
Spermolepis echinatus Heller, Contr. Herb. Franklin & Marshall Coll. **1**: 73. 1895.
Taenidia integerrima Drude, Engler & Prantl, Nat. Pflanzenfam. **3**^{8}: 195. 1898.
Taeniopleurum howellii, Bot. Gaz. **14**: 284. 1889.
Thaspium trifoliatum aureum Britton, Mem. Torr. Club **5**: 240. 1894.
Uraspermum nudum Kuntze, Rev. Gen. Pl. **1**: 270. 1891.
Velaea texana Drude, l. c. 169. 1898.
Washingtonia brachypoda Heller, Cat. N. Am. Pl. 5. 1898.
Washingtonia claytoni Britton in Britt. & Br. Ill. Fl. **2**: 530. 1897.
Washingtonia intermedia Rydberg, Mem. N. Y. Bot. Garden **1**: 289. 1900.
Washingtonia longistylis Britton in Britt. & Br. Ill. Fl. **2**: 530. 1897.
Washingtonia nuda Heller, Cat. N. Am. Pl. 5. 1898.
Zizia bebbii Britton, Mem. Torr. Club **2**: 35. 1890.

A comparison of the genera and species presented by the Revision and the Monograph will serve to illustrate the development of our knowledge of the family. The Revision contained 52 native genera and 217 native species, to which may be added 7 introduced genera and 16 introduced species. The Monograph contains 62 native genera and 332 native species; and in addition 16 introduced genera and 39 introduced species.

A tabular statement presenting this comparison in greater detail is as follows:

Generic representation in the Revision.

Genus.	Native species.	Introduced species.	Whole number of species.
1. Aegopodium	....	1	1
2. Aethusa	....	1	1
3. Aletes	1	....	1
4. Ammoselinum	2	....	2
5. Angelica	16	....	16
6. Anthriscus	....	1	1
7. Apiastrum	2	....	2
8. Apium	1	3	4
9. Berula	1	....	1
10. Bifora	1	....	1
11. Bowlesia	1	....	1
12. Bupleurum	1	1	2
13. Carum	4	1	5
14. Caucalis	1	2	3
15. Chaerophyllum	1	....	1
16. Cicuta	3	....	3
17. Coelopleurum	2	....	2
18. Coloptera	3	....	3
19. Conioselinum	1	....	1
20. Conium	....	1	1
21. Coriandrum	....	1	1
22. Crantzia	1	....	1
23. Cryptotaenia	1	....	1
24. Cymopterus	13	....	13
25. Cynosciadium	2	....	2
26. Daucus	1	1	2
27. Discopleura	2	....	2
28. Erigenia	1	....	1
29. Eryngium	22	....	22
30. Eulophus	5	....	5
31. Eurytaenia	1	....	1
32. Foeniculum	....	1	1
33. Harbouria	1	....	1
34. Heracleum	1	....	1
35. Hydrocotyle	7	....	7
36. Leptocaulis	2	....	2
37. Leptotaenia	7	....	7
38. Ligusticum	9	....	9
39. Museniopsis	1	....	1
40. Musenium	3	....	3
41. Oenanthe	1	....	1
42. Oreoxis	1	....	1
43. Orogenia	2	....	2
44. Osmorhiza	6	....	6
45. Pastinaca	....	1	1
46. Peucedanum	43	....	43
47. Phellopterus	1	....	1
48. Pimpinella	2	1	3
49. Podistera	1	....	1
50. Polytaenia	1	....	1
51. Pseudocymopterus	3	....	3
52. Sanicula	10	....	10
53. Selinum	7	....	7
54. Sium	2	....	2
55. Thaspium	3	....	3
56. Tiedemannia	4	....	4
57. Trepocarpus	1	....	1
58. Velaea	6	....	6
59. Zizia	2	....	2
Total	217	16	233

Generic representation in the Monograph.

Genus.	Native species.	Introduced species.	Whole number of species.
1. Aegopodium	....	1	1
2. Aethusa	....	1	1
3. Aletes	4	....	4
4. Ammi	....	2	2
5. Ammoselinum	3	....	3
6. Anethum	....	1	1
7. Angelica	21	....	21
8. Anthriscus	....	3	3
9. Apiastrum	2	....	2
10. Apium	1	3	4
11. Aulospermum	9	....	9
12. Berula	1	....	1
13. Bifora	1	1	2
14. Bowlesia	1	....	1
15. Bupleurum	1	3	4
16. Carum	4	1	5
17. Caucalis	1	1	2
18. Centella	1	....	1
19. Chaerophyllum	3	2	5
20. Cicuta	8	....	8
21. Coelopleurum	4	....	4
22. Conioselinum	5	....	5
23. Conium	....	1	1
24. Coriandrum	....	1	1
25. Cuminum	....	1	1
26. Cymopterus	7	....	7
27. Cynomarathrum	7	....	7
28. Cynosciadium	3	....	3
29. Daucus	1	1	2
30. Deringa	1	....	1
31. Deweya	1	....	1
32. Drudeophytum	6	....	6
33. Erigenia	1	....	1
34. Eryngium	29	4	33
35. Eulophus	6	....	6
36. Euryptera	6	....	6
37. Eurytaenia	1	....	1
38. Foeniculum	....	1	1
39. Glehnia	1	....	1
40. Harbouria	1	....	1
41. Heracleum	1	1	2
42. Hesperogenia	1	....	1
43. Hydrocotyle	9	....	9
44. Imperatoria	....	1	1
45. Leibergia	1	....	1
46. Leptotaenia	11	....	11
47. Levisticum	....	1	1
48. Ligusticum	20	....	20
49. Lilaeopsis	4	....	4
50. Lomatium	58	....	58
51. Museniopsis	1	....	1
52. Musineon	4	....	4
53. Oenanthe	1	1	2
54. Oreoxis	3	....	3
55. Orogenia	2	....	2
56. Oxypolis	5	....	5
57. Pastinaca	....	1	1
58. Petroselinum	....	1	1
59. Phellopterus	5	....	5
60. Pimpinella	....	2	2
61. Podistera	1	....	1
62. Polytaenia	1	....	1
63. Pseudocymopterus	4	....	4
64. Pteryxia	7	....	7
65. Ptilimnium	3	....	3
66. Rhysopterus	3	....	3
67. Sanicula	18	....	18
68. Scandix	....	1	1
69. Sium	3	....	3
70. Spermolepis	2	....	2
71. Sphenosciadium	2	....	2
72. Taenidia	1	....	1
73. Taeniopleurum	1	....	1
74. Thaspium	3	....	3
75. Torilis	....	2	2
76. Trepocarpus	1	....	1
77. Washingtonia	12	....	12
78. Zizia	3	....	3
Total	332	39	371

Thirty of the generic names found in the last table do not appear in the first. Of these 7 are the names of introduced genera, 7 have replaced later names, 1 has replaced a homonym, 7 are segregates, and 8 are new since the publication of the Revision.

GENERA NOT GIVEN IN THE REVISION.

[1] Anethum L.
Aulospermum C. & R.=Cymopterus in part.
Centella L.=Hydrocotyle in part.
Cynomarathrum Nutt.=Peucadanum in part.
[1] Cuminum L.
Deringa Adans.=Cryptotaenia DC.
Deweya T. & G.=Velaea arguta.
Drudeophytum C. & R.=Velaea in part.
Euryptera Nutt.=Peucedanum in part.
Glehnia F. Schmidt=Phellopterus Benth.
Hesperogenia C. & R.
[1] Imperatoria L.
Leibergia C. & R.
[1] Levisticum Koch.
Lilaeopsis Greene=Crantzia Nutt.
Lomatium Raf.=Peucedanum of all American authors.
Musineon Raf.=Musenium Nutt.
Oxypolis Raf.=Tiedemannia DC.
[1] Petroselinum Hoffm.
Phellopterus Nutt.=Cymopterus in part.
Pteryxia Nutt.=Cymopterus in part.
Ptilimnium Raf.=Leptocaulis Nutt.
Rhysopterus C. & R.=Cymopterus in part.
[1] Scandix L.
Spermolepis Raf. = Discopleura DC.
Sphenosciadium Gray = Selinum capillaceum B. & H.
Taenidia Drude = Pimpinella integerrima B. & H.
Taeniopleurum C. & R. = Carum howellii C. & R.
[1] Torilis Adans.
Washingtonia Raf. = Osmorhiza Raf.

The following generic names used in the Revision disappear. Two genera, *Coloptera* C. & R. and *Phellopterus* Benth., become synonyms; *Crantzia* is a homonym; *Peucedanum* L., *Selinum* L., and *Velaea* DC. are excluded from our flora; the other genera give place to earlier names.

GENERIC NAMES WHICH DISAPPEAR.

Coloptera C. & R. = Cymopterus Raf.
Crantzia Nutt. = Lilaeopsis Greene.
Cryptotaenia DC = Deringa Adans.
Discopleura DC. = Spermolepis Raf.
Leptocaulis Nutt. = Ptilimnium Raf.

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[1] Introduced genera.

Musenium Nutt. = Musineon Raf.
Osmorhiza Raf. = Washingtonia Raf.
Peucedanum L. = excluded.
Phellopterus Benth. = Glehnia F. Schmidt.
Selinum L. = excluded.
Tiedemannia DC. = Oxypolis Raf.
Velaea DC. = excluded.

In the Revision the genera were arranged in a sequence which was somewhat artificial, while in the Monograph the more natural sequence of Drude is followed.

In connection with the descriptions of genera and species, only what we regard as the essential synonymy is cited, in all cases including the first use of the name. Of these references there are nearly 800, and with the exception of 5 all have been verified. In the process of this verification we have been more impressed than ever by the numerous errors which creep into unverified citations and are thus indefinitely perpetuated.

The following references have not been verified by the authors:

Anthriscus Bernh. Syst. Verz. Ery. 113. 1800.
Berula Hoffm. in Bess. Enum. Pl. Volh. 44. 1821.
[1] Bifora Hoffm. Umb. Gen. ed. 2. 191. 1816.
[1] Bupleurum protractum Hoffmgg. & Link, Fl. Port. **2**:387. 1820.
Hydrocotyle natans Cyrilli, Pl. Rar. Neap. 1:20. 1792.

The type locality is also given wherever the information is accessible, and we have thought it best to quote the original statement in reference to it, with such explanatory remarks as seem necessary to make it more definite. The collector and present location of the type specimens are also named, so far as known.

As there is at present considerable discussion regarding the manner of selecting the type species of a genus, we have given some attention to the subject. With the exception of the Linnaean genera, the results are the same whether the first species is selected as the type or the method of residues is used. In this connection the data given below are of interest. Of the 26 Linnaean genera, 3 do not at present contain the first species originally cited by Linnaeus, viz, *Apium*, *Caucalis*, and *Ligusticum*.

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[1] References verified by Dr. William Trelease.

Genera published in first edition of Linnaeus's Species Plantarum, 1753.

Genus.	Number species given in Sp. Pl.	First species cited.	Present generic reference of first species.
[1]Aegopodium	1	podagraria.	
[1]Aethusa	1	cynapium.	
[1]Ammi	2	majus.	
[1]Anethum	2	graveolens.	
Angelica	4	archangelica.	
Apium	2	petroselinum	Petroselinum.
Bupleurum	13	rotundifolium.	
Carum	1	carui.	
Caucalis	6	grandiflora	Daucus.
Chaerophyllum	6	silvestre.	
Cicuta	3	virosa.	
[1]Conium	3	maculatum.	
[1]Coriandrum	2	sativum.	
[1]Cuminum	1	cyminum.	
Daucus	3	carota.	
Eryngium	8	foetidum.	
Heracleum	5	sphondylium.	
Hydrocotyle	5	vulgaris.	
[1]Imperatoria	1	ostruthium.	
Ligusticum	4	levisticum	Levisticum.
Oenanthe	5	fistulosa.	
[1]Pastinaca	2	sativa.	
[1]Pimpinella	4	saxifraga.	
Sanicula	3	europaea.	
[1]Scandix	8	odorata.	
Sium	8	latifolium.	

[1] Represented in America by introduced species only. All the other genera contain endemic species, but are based on Old World species.

Thirty-three post-Linnaean genera were based on single species, and the type is therefore easily determined. These genera, with the species upon which each was based, are shown in the following table:

Post-Linnaean genera.

Genus.	Type species.
Aletes C. & R	Deweya acaulis Torr.
Ammoselinum T. & G	A. popei T. & G.
Anthriscus Bernh	A. vulgaris Bernh.
Berula Hoffm	Sium erectum L.
Bifora Hoffm	B. dicocca Hoffm.
Coelopleurum Ledeb	Archangelica gmelini DC.
Cymopterus Raf	Selinum acaule Pursh.
Deringa Adans	Sison canadense L.
Deweya T. & G	D. arguta T. & G.
Erigenia Nutt	Sison bulbosum Michx.
Eulophus Nutt	E. americanus Nutt.
Euryptera Nutt	E. lucida Nutt.
Eurytaenia T. & G	E. texana T. & G.
Glehnia F. Schmidt	Cymopterus littoralis Gray.
Harbouria C. & R	Thaspium trachypleurum Gray.
Hesperogenia C. & R	H. stricklandi C. & R.
Leibergia C. & R	L. orogenioides C. & R.
Levisticum Koch	Ligusticum levisticum L.
Lilaeopsis Greene	Hydrocotyle lineata Michx.
Lomatium Raf	L. villosum Raf.
Museniopsis C. & R	Tauschia texana Gray.
Musineon Raf	Seseli divaricatum Pursh.
Oreoxis Raf	O. humilis Raf.
Orogenia Watson	O. linearifolia Watson.
Petroselinum Hoffm	Apium petroselinum L.
Podistera Watson	Cymopterus nevadensis Gray.
Polytaenia DC	P. nuttallii DC.
Ptilimnium Raf	Ammi capillaceum Michx.
Spermolepis Raf	Daucus divaricatus Walt.
Taeniopleurum C. & R	Carum howellii C. & R.
Taenidia Drude	Smyrnium integerrimum L.
Sphenosciadium Gray	S. capitellatum Gray.
Washingtonia Raf	Myrrhis claytoni Michx.
Zizia Koch	Zizia aurea Koch.

The four following are pre-Linnaean genera not recognized by Linnaeus, but afterwards restored as indicated:

Torilis Adanson, Fam. **2**: 99. 1763. No species cited.

Foeniculum Adanson, Fam. **2**: 101. 1763. =Anethum foeniculum L.

Levisticum Koch, Nov. Act. Caes. Leop. Acad. **12**: 101. 1824. =Ligusticum levisticum L.

Petroselinum Hoff. Gen. Umb. 78. 1814.=Apium petroselinum L.

In only twelve of the post-Linnaean genera, including the three genera here published for the first time, were there more than one species included in the original description. In some of these genera the type is indicated, while in the other cases we have cited the first species. These genera, with the number of original species, and with the type species or first species cited, are given in the following table:

Post-Linnaean genera.

Genus.	Number species.	Type, or first species cited.
Apiastrum Nutt	2	A. angustifolium Nutt.
Aulospermum C. & R.		Cymopterus longipes Watson.
Cynosciadium DC.	2	C. digitatum DC.
Drudeophytum C. & R		Deweya hartwegi Gray.
Leptotaenia Nutt	3	L. dissecta Nutt.
Oxypolis Raf.	5	Sium rigidius L.
Phellopterus Nutt	2	P. montanus Nutt.
Pseudocymopterus C. & R	3	Thaspium(?) montanum Gray.
Pteryxia Nutt.	4	Selinum terebinthinum Hook.
Rhysopterus C. & R	3	R. plurijugus C. & R.
Thaspium Nutt	5	T. aureum Nutt.
Trepocarpus Nutt.	2	T. aethusae Nutt.

The four following genera were established without specific types:

Torilis and Foeniculum, pre-Linnaean genera, were restored by Adanson in 1863.

Conioselinum, described by Hoffman in 1814, was redescribed in 1816, with *C. tartaricum* as the type.

Bowlesia was described by Ruiz and Pavon in 1794, but with an unnamed plate of *B. palmata*, which was named a few years afterwards.

We have given the general geographical range, and such important specimens as have been studied in preparing this monograph are cited. It should be remembered, however, that the range given is often the reported range, while the range as we know it is shown by the specimens cited. It will be noticed that a great many specimens cited in the Revision are not included among those cited in the Monograph, so that the latter work represents a great extension of the horizon so far as it can be furnished by material.

It has been thought wise to assist in the recognition of genera by including in the text illustrations of characteristic fruits, showing both surface and cross section. Every genus containing native species is illustrated either by a plate or by at least two text cuts. A few of the figures have been published before, but for the most part the drawings have been prepared by Miss Anna Synder, under the direction of J. N. Rose. The drawings for the plates were made by Mr. Frederick A. Walpole.

We have also attempted to separate with great distinctness the native genera and species from the introduced ones. Accordingly, the latter are grouped together at the end of the Monograph, but are included in the general keys.

It is a matter of regret that no adequate presentation of the family from the ecological standpoint seems to be possible as yet. The general facts of the geographical distribution have long been known, and need not be repeated here; but the wide range of conditions, the great variability of numerous forms, the indefiniteness of many of the recognized genera, all assure us that it is a group in which a study of the relation between forms and conditions would be very profitable.

This work has been based chiefly upon the collection in the National Herbarium, formerly deposited at the Department of Agriculture, now under the care of the U. S. National Museum. Here are to be found all the types of new species described in this work, as well as the first set of all the Government surveys for the last fifty years. This collection contains about 9,000 sheets of Umbelliferae, and has undoubtedly the richest representation of North American Umbelliferae in the world.

The work has been supplemented by an examination of the Coulter herbarium, now in the University of Chicago, which contains nearly all of the types of our Revision. Every specimen has been examined in the Philadelphia Academy of Science, the New York Botanical Garden, the Gray herbarium at Cambridge, Frank Tweedy's herbarium (Washington), a part of Professor Greene's herbarium (Catholic University, Washington), a part of Mr. Thomas H. Kearney's collection (rich in southern species); also certain types from the M. E. Jones herbarium, from the California Academy of Science, and from the University of California, as well as from numerous collectors. The Canby herbarium, now in the College of Pharmacy, New York City, was placed at our disposal by Dr. H. H. Rusby. The entire collection of Walter Deane's herbarium has passed through our hands, and although it is confined to the range of Gray's Manual it contains many interesting plants, all of which are mounted in the most perfect manner.

Among those who have assisted us should be mentioned the following: Mr. Frederick V. Coville, who greatly interested himself in the publication of this report and offered many valuable suggestions; Prof. E. L. Greene, who placed his herbarium and choice library at our disposal and gave help in knotty questions of nomenclature; Dr. B. L. Robinson, Dr. N. L. Britton, and Mr. Thomas Meehan, who not only loaned material from the great herbaria which they control, but extended many courtesies while at work in their separate institutions; Dr. W. L. Jepson, who loaned or sent material from his private collection and from the University of California; Miss Alice Eastwood, who loaned specimens of Hydrocotyle from the California Academy of Science; Prof. Harry Garman, who sent material from Kentucky, and Mr. George E. Osterhout, from Colorado; Messrs. C. V. Piper and L. F. Henderson, who sent material from the Northwest, accompanied by many valuable notes and suggestions; and Mr. J. W. Blankinship, who sent material from Montana. Mr. W. Botting Hemsley and Mr. H. Harold W. Pearson have looked up types at Kew; while Mr. E. G. Baker of the British Museum has given assistance in comparing our material with types in London.

As more or less confusion sometimes occurs through failure to cite the specimens from which a drawing is made, we give the following data concerning the collections used in making the original drawings, the order being that of the generic sequence. The specimens are all to be found in the U. S. National Herbarium:

Data concerning specimens shown in text figures.

Name of species.	Locality.	Collector.	Number.	Date.
Hydrocotyle cuneata	Montezuma well, Arizona.	MacDougal	575	August 7, 1891.
Centella asiatica	Florida	Chapman	4004e	June.
Bowlesia septentrionalis	Tucson, Ariz	M. Zuck		May 16, 1896.
Sanicula trifoliata	New York	Bicknell		September 22, 1895
Chaerophyllum tainturieri dasycarpum.	Texas	Jermy	141	
Washingtonia brachypoda	California	Parish	3479	June 29, 1894.
Caucalis microcarpa	Idaho	Sandberg	328	June 6, 1892.
Bifora americana	Texas	Heller	1656	May 14–21, 1894.
Apiastrum patens	Indian Territory	Bush	187	June 21, 1894.
Erigenia bulbosa	District of Columbia	Vasey		1881.
Orogenia linearifolia	Washington	Suksdorf		May 17, 1882.
Musineon tenuifolium	Nebraska	Rydberg	127	July 4, 1891.
Deweya arguta	California	Parish	4470	June 26, 1897.
Drudeophytum hartwegi	California	Mrs. Austin	866	June, 1896.
Museniopsis texana	Texas	Wurzlow		May, 1895.
Bupleurum americanum	Wyoming	Rose	341	September 6, 1893.
Trepocarpus aethusae	Indian Territory	Sheldon	101	July 6, 1891.
Apium ammi	Texas	Havard		May, 1883.
Spermolepis divaricata	New Mexico	Dewey		June, 1891.
Ammoselinum popei	Texas	Havard		May, 1883.
Zizia cordata	Pennsylvania	Porter		September 25, 1891.
Harbouria trachypleura	Colorado	Osterhout		July, 1895.
Cicuta maculata	Kansas	Crevecœur	24	1892.
Deringa canadensis	Minnesota	Mearns		August 31, 1891.
Taeniopleurum howelli	Oregon	Howell		
Carum oreganum	Oregon	Coville & Leiberg	251	August 6, 1896.
Aletes acaulis	Colorado	Patterson	37	July 1, September 9, 1885.
Taenidia integerrima	Michigan	Davis		August 28, 1891.
Eulophus americanus	Illinois	Hall		July, 1861.
Sium cicutaefolium	South Dakota	Thornber		August 25, 1893.
Berula erecta	Wyoming	A. Nelson	2766	August 27, 1896.
Ptilimnium capillaceum	Florida	Nash	1930	May 28, June 15 1895.
Cynosciadium pinnatum	Texas	Nealley	157	1890.
Oenanthe sarmentosa var	California	Jepson		June 19, 1897.
Podistera nevadensis	California	Lemmon		1898.
Eurytaenia texana	Texas	Nealley		1888.
Sphenosciadium capitellatum	California	Hansen	324	August 23, 1893.
Ligusticum canadense	North Carolina	Merriam		September 9, 1892.
Coelopleurum longipes	Oregon	Howell	735	July 28, 1891.
Oreoxis humilis	Colorado	Canby		August 27, 1895.
Oreoxis bakeri	Colorado	Baker	577	July 14, 1898.
Thaspium trifoliatum	Tennessee	Kearney	704	September 7, 1897.
Conioselinum gmelini	Washington	Piper	631	July 23, 1890.
Glehnia littoralis	Oregon	Howell		July 14, 1882.
Phellopterus montanus	Colorado	Bethel		June 25, 1898.
Pteryxia terebinthina	Washington	Suksdorf		June 3–July, 1883.
Aulospermum longipes	Utah	Jones		May 24, 1895.
Cymopterus parryi	Wyoming	Jones		June 24, 1896.
Rhysopterus plurijugus	Oregon	Leiberg	2240	
Pseudocymopterus montanus	Colorado	Bethel	3618	August, 1895.
Polytaenia nuttallii	Illinois	Hall		June, 1868.
Oxypolis rigidior	Maryland	Pollard	752	October 6, 1895.
Leptotaenia multifida	Nevada	Jones		May 20, 1893.
Lomatium nevadense	Oregon	Leiberg	361	June 30, 1894.
Euryptera howellii	Oregon	Howell		July 7, 1887.
Euryptera lucida				
Cynomarathrum lapidosum	Wyoming	Jones		
Cynomarathrum eastwoodae	Colorado	Miss Eastwood		May, 1892.
Heracleum lanatum	Oregon	Sheldon	8148	1897.
Daucus pusillus	Arizona	M. Zuck		May 16, 1896.

The following illustrations are reproduced, a part having been used in this series (Contr. Nat. Herb.), while the others have been placed in our hands by the editors of the Botanical Gazette, the editor of the Proceedings of the Washington Academy of Sciences, and the director of the Kew Gardens. The place and year of publication of each are given below:

Angelica roseana, Contr. Nat. Herb. **5**: pl. 24. 1899.
Drudeophytum glaucum, Contr. Nat. Herb. **3**: pl. 14. 1895.
Eryngium sparganophyllum, Hook. Ic. pl. 2508. 1897. Also Proc. Wash. Acad. **1**: fig. 4. 1900.
Hesperogenia stricklandi, Contr. Nat. Herb. **5**: pl. 27. 1899.
Leibergia orogenioides, Contr. Nat. Herb. **3**: pl. 27. 1896.
Ligusticum leibergi, Contr. Nat. Herb. **3**: pl. 12. 1895.
Ligusticum eastwoodae, Contr. Nat. Herb. **3**: pl. 13. 1895.
Lilaeopsis carolinensis, Bot. Gaz. **24**: 49. fig. 4. 1897.
Lilaeopsis lineata, Bot. Gaz. **24**: 47. fig. 1. 1897.
Lilaeopsis occidentalis, Bot. Gaz. **24**: 48. fig. 2. 1897.
Lilaeopsis schaffneriana, Bot. Gaz. **24**: 48. fig. 3. 1897.

ARTIFICIAL KEY TO THE GENERA OF NORTH AMERICAN UMBELLIFERAE.

Only the most prominent features of each genus are included and exceptional species may be omitted. The native genera are printed in **bold-face** type; the introduced genera in *italics*. The appended numbers refer to the pages upon which the genera are fully described.

Flowers in dense heads .... **Eryngium**, 42.
Flowers not in heads, evidently umbellate.
  Fruit conspicuously bristly.
    Fruit covered with spines or hooked bristles.
      Fruit with strong spines .... *Torilis*, 251.
      Fruit with hooked bristles.
        Leaves palmately divided, with broad segments .... **Sanicula**, 32.
        Leaves ternately dissected, with filiform segments .... **Spermolepis**, 87.
    Fruit with bristles only on the ribs.
      Bristles barbed at tip; stylopodium obsolete .... **Daucus**, 249.
      Bristles not barbed; stylopodium conical .... **Caucalis**, 69.
  Fruit not bristly (except *Washingtonia* and *Cuminum*).
    OIL TUBES OBSOLETE OR OBSCURE.
      Fruit strongly flattened laterally.
        Fruit with secondary ribs and reticulations; involucre conspicuous. **Centella**, 29.
        Fruit without secondary ribs or reticulations; involucre wanting. **Hydrocotyle**, 25.
      Fruit not strongly flattened.
        Seed face concave.
          Stylopodium conical.
            Fruit usually bristly .... **Washingtonia**, 60.
            Fruit smooth.
              Fruit linear oblong.
                Fruit without ribs .... *Anthriscus*, 251.
                Fruit ribbed .... *Scandix*, 251.
              Fruit of nearly distinct globose carpels .... **Bifora**, 70.
          Stylopodium flat or wanting.
            Leaves simple and perfoliate .... **Bupleurum**, 84.
            Leaves large and decompound .... *Conium*, 252.
        Seed face plane.
          Leaves simple and lobed; southwestern .... **Bowlesia**, 30.
          Leaves biternate; introduced at the east .... *Aegopodium*, 254.

OIL TUBES DISTINCT.

FRUIT STRONGLY FLATTENED DORSALLY, with lateral ribs more or less prominently winged.

Oil tubes solitary in the intervals.

Stylopodium conical.

Slender and glabrous.................................**Oxypolis,** 192.

Stout and pubescent, at least in the umbel.

Leaves once or twice pinnate.................**Sphenosciadium,** 127.

Leaves large and ternately compound ....**Heracleum,** 248.

Stylopodium flat or wanting.

Caulescent and branching.

Flowers white.

Slender; leaves pinnately dissected; dorsal ribs filiform.

Lateral wings thick and prominent; Texan....**Eurytaenia,** 126.

Lateral wings narrow; introduced ....*Anethum,* 255.

Stout, leaves ternately or pinnately compound; dorsal ribs prominent ....**Angelica,** 153.

Flowers yellow.

Dorsal ribs prominent ....*Levisticum,* 255.

Dorsal ribs filiform ....*Pastinaca,* 255.

Acaulescent, or nearly so.

Stylopodium wanting; calyx teeth minute or obsolete; dorsal ribs filiform.

Leaves ternate to dissected, with narrow or small leaflets. **Lomatium,** 204.

Leaves once or twice compound, with broad and sharply toothed leaflets..................................**Euryptera,** 240.

Stylopodium flat but evident; calyx teeth evident; dorsal ribs sharp or winged.........................**Cynomarathrum,** 244.

Oil tubes more than one in the intervals.

Caulescent and branching.

Dorsal ribs obsolete; laterals corky-thickened; flowers yellow. **Polytaenia,** 191.

Dorsal ribs prominent; laterals not corky-thickened; flowers white.

Leaves ternately or pinnately compound.

Leaves once ternate, with broad, stalked segments. *Imperatoria,* 255.

Leaves more than once ternate or pinnate.........**Angelica,** 153.

Leaves much more compounded................**Conioselinum,** 149.

Acaulescent or nearly so.

Lateral wings thin.

Stylopodium wanting; calyx teeth minute or obsolete; dorsal ribs filiform.

Leaves ternate to dissected, with narrow or small leaflets. **Lomatium,** 204.

Leaves once or twice compound, with broad and sharply toothed leaflets ....**Euryptera,** 240.

Stylopodium flat but evident; calyx teeth evident; dorsal ribs sharp or winged ....**Cynomarathrum,** 244.

Lateral wings thick.

Dorsal ribs very prominent or slightly winged. **Pseudocymopterus,** 187.

Dorsal ribs filiform.

Dwarf, with small pinnate or lobed leaves......**Cymopterus,** 179.

Tall and stout, with large pinnately decompound leaves. **Leptotaenia,** 196.

- FRUIT NOT STRONGLY FLATTENED DORSALLY, usually more or less laterally flattened.
  - **Oil tubes solitary in the intervals.**
    - *Stylopodium conical.*
      - Leaflets (at least the upper) linear to filiform.
        - Involucre wanting; introduced.
          - Flowers white.................*Coriandrum*, 252.
          - Flowers yellow.................*Foeniculum*, 254.
        - Involucre present; flowers white (except *Cuminum*).
          - Low and diffuse, with ternately divided leaves. **Ammoselinum**, 88.
          - Taller and erect.
            - Leaves finely dissected.
              - Fruit ovate.
                - Fruit smooth.................**Ptilimnium**, 117.
                - Fruit bristly or tuberculate.................**Spermolepis**, 87.
              - Fruit linear-oblong.
                - Fruit smooth; flowers white.................**Trepocarpus**, 85.
                - Fruit bristly; flowers rose color.................*Cuminum*, 253.
            - Leaves with few leaflets.
              - Lateral ribs thick and corky; southern...**Cynosciadium**, 120.
              - Ribs all filiform; western.................**Carum**, 103.
      - Leaflets broader.
        - Seed face concave.................**Chaerophyllum**, 58.
        - Seed face plane.
          - Fruit oblong to orbicular.
            - Involucre of few bracts or none.................**Cicuta**, 93.
            - Involucre conspicuous.................**Taeniopleurum**, 102.
          - Fruit linear-oblong.................**Deringa**, 101.
    - *Stylopodium flat or wanting.*
      - Flowers white.
        - Ribs thick and corky, at least the laterals.
          - Dorsal ribs filiform; aquatic.
            - Leaves reduced to hollow petioles.................**Lilaeopsis**, 123.
            - Leaves pinnate or decompound.................**Oenanthe**, 121.
          - All the ribs prominent and corky.
            - Ribs wing-like and much wrinkled when young. **Rhysopterus**, 185.
            - Ribs broad and not wrinkled.
              - Fruit small (not more than 2 mm. long), flattened laterally.
                - Involucre wanting.................**Apium**, 86.
                - Involucre present.................*Ammi*, 253.
              - Fruit larger, ovoid-globose.................*Aethusa*, 254.
        - Ribs filiform or obsolete.
          - Ribs filiform.................**Leibergia**, 108.
          - Ribs obscure or obsolete.................**Apiastrum**, 71.
      - Flowers yellow.
        - Ribs equal, broad, and corky.
          - Low and cespitose; high alpine.................**Oreoxis**, 143.
          - A foot or more high; in the foothills or low ground.
            - Fruits tuberculate-roughened; calyx teeth evident. **Harbouria**, 92.
            - Fruit smooth; calyx teeth obsolete.................*Petroselinum*, 253.
        - Ribs winged or filiform.

- Ribs conspicuously winged ....**Thaspium**, 145.
- Ribs filiform.
  - Tall and branching, with broad leaflets................**Zizia**, 90.
  - Acaulescent and cespitose...........................**Aletes**, 106.

- **Oil tubes more than one in the intervals.**
  - *Stylopodium conical.*
    - Fruit round, with globose carpels and very slender inconspicuous ribs. **Berula**, 116.
    - Fruit ovate to oblong.
      - Fruit with prominent equal ribs..................**Ligusticum**, 129.
      - Fruit with filiform or almost obsolete ribs.
        - Involucre usually present; ribs equal and filiform..**Eulophus**, 110.
        - Involucre usually wanting; ribs almost obsolete....*Pimpinella*, 254.
  - *Stylopodium flat or wanting.*
    - Seed face sulcate or decidedly concave.
      - Carpels flattened dorsally.
        - Ribs filiform....................................**Musineon**, 76.
        - Ribs with broad, thin wings.................**Aulospermum**, 174.
      - Carpels terete or flattened laterally.
        - Carpels terete.
          - Seed face involute, inclosing a central cavity. **Drudeophytum**, 80.
          - Seed face with a deep sulcus.
            - Ribs filiform; calyx teeth obsolete ....**Museniopsis**, 83.
            - Ribs prominent and very acute; calyx teeth prominent. **Deweya**, 79.
      - Carpels strongly flattened laterally ....**Erigenia**, 73.
    - Seed face plane, or but slightly concave.
      - All the ribs conspicuously winged.
        - Wings corky-thickened; tomentose seashore plants..**Glehnia**, 165.
        - Wings thin; plants of the mountains and plains.
          - Leaves pinnate, with short, crowded, and more or less confluent segments; flowers usually purple......**Phellopterus**, 166.
          - Leaves ternate-pinnate, with short linear and more or less pungent segments; flowers usually yellow.....**Pteryxia**, 170.
      - Ribs not winged.
        - All the ribs filiform.
          - Acaulescent, mountain plants.
            - Flowers yellow; calyx teeth obsolete......**Hesperogenia**, 75.
            - Flowers white or pinkish; calyx teeth prominent. **Podistera**, 125.
          - Caulescent, low-ground plants ....**Taenidia**, 109.
        - Ribs corky, at least the laterals.
          - Lateral ribs thick and corky, the dorsals filiform..**Orogenia**, 74.
          - All the ribs corky and equally prominent.
            - Fruit not flattened either way ....**Coelopleurum**, 140.
            - Fruit flattened laterally.
              - Oil tubes continuous about seed cavity.....**Bupleurum**, 84.
              - Oil tubes one to three in the intervals...........**Sium**, 114.

NATIVE GENERA AND SPECIES.

1. HYDROCOTYLE L. Sp. Pl. 1: 234. 1753.

Calyx teeth minute or obsolete. Fruit more or less orbicular, strongly flattened laterally. Carpel with five primary ribs, the dorsal marginal, broad or filiform; intermediates filiform (rarely obsolete), usually curved; laterals filiform or broad, distinct from those of the other carpel or confluent; a prominent oil-bearing layer beneath the epidermis, occasionally containing small oil tubes, and usually a thick layer of strengthening cells surrounding the seed cavity. Low herbaceous perennials growing in or near water, with slender creeping stems, orbicular-peltate or reniform leaves, and small white flowers in simple or proliferous umbels without involucre.

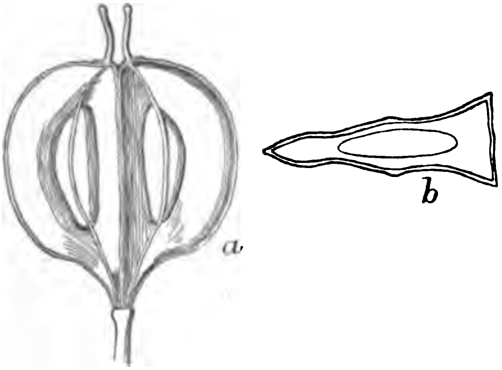


FIG. 1.—Hydrocotyle cuneata: *a*, × 10; *b*, × 20.

First species cited, *H. vulgaris* L.

A genus widely distributed in both hemispheres, containing about 75 species, 9 of which are found in the United States and Canada.

Fruit with pericarp thin except at the broad thick corky dorsal and lateral ribs; involucre of short ovate bracts; leaves orbicular-peltate, crenate; peduncles as long as petioles, both from slender creeping rootstocks.
 Fruit notched at base and apex.
  Umbels simple .... 1. *H. umbellata.*
  Umbels proliferous.
   Umbels few.
    Dorsal ribs very obtuse; California........................ 2. *H. prolifera.*
    Dorsal ribs rather acute; Atlantic coast .... 3. *H. canbyi.*
   Umbels numerous in a profusely branching inflorescence... 4. *H. bonariensis.*
 Fruit not notched.
  Fruit not cuneate at base.
   Fruit subsessile .... 5. *H. verticillata.*
   Fruit pedicellate... 6. *H. australis.*
  Fruit cuneate at base .... 7. *H. cuneata.*
Fruit with pericarp uniformly corky-thickened and ribs all filiform; leaves not peltate; peduncles much shorter than petioles.
 Leaves thin, with short petioles; umbels subsessile.............. 8. *H. americana.*
 Leaves thicker, with elongated petioles; umbels peduncled .. 9. *H. ranunculoides.*

1. Hydrocotyle umbellata L. Sp. Pl. 1: 234. 1753.

H. umbellulata Michx. Fl. Bor. Am. 1: 161. 1803.

Descending branches of the rootstock with round tubers; umbels many-flowered, simple (rarely slightly proliferous); pedicels 4 to 12 mm. long; fruit strongly notched, 2 mm. long, about 3 mm. broad, with dorsal ribs prominent but obtuse.

Type locality, "in America."

In the Atlantic States from Massachusetts to Florida, and westward to Minnesota and Texas; also in southern California and extending into Mexico.

Specimens examined:

MASSACHUSETTS: No Man's Land, *L. F. Ward*, August 10, 1889.

NEW YORK: Wading River, Long Island, *E. S. Miller*, August 12, 1873; river banks near Oswego, *C. S. Sheldon*, August 6, 1880.

MARYLAND: Ocean City, *Canby*, August, 1874.

INDIANA: Long Lake, near Lake Michigan, *Umbach*, September 18, 1897.

VIRGINIA: Near Ocean View Hotel, *Coville* 30, June 22, 1890.

NORTH CAROLINA: Ponds and ditches near Wrightsville, *Biltmore Herb.* 4005, July 1, 1897.

FLORIDA: Near Jacksonville, *Curtiss* 991, 4334, 4692, 5676; near Apalachicola, *Biltmore Herb.* 4005*b*, May, 1887; near Eustis, Lake County, *Nash* 351, April 1-15, 1894; Tampa, *C. L. Pollard*, March 7, 1898.

MISSISSIPPI: Petit Bois Island, Biloxi, and Ship Island, *Tracy*, May, 1898.

CALIFORNIA: Near San Bernardino, *Parish Bros.* 920, May, 1882; near Colton, *Jones* 3192, April 28, 1882; same station, *Dunn*, July, 1888; Big Morongo, eastern base of San Bernardino Mountains, *S. B. Parish* 3192, June 15, 1894; near San Jacinto, *Leiberg* 3103, March 8, 1898.

We have excluded numerous forms, including many proliferous ones, which have been included under this species.

2. **Hydrocotyle prolifera** Kellogg, Bot. Calif. **1**: 254. 1876.

Tuberous as in *H. umbellata;* umbels proliferous, with 3 to 5 whorls, each containing 5 to 20 flowers; pedicels 2 to 6 mm. long; fruit slightly notched, 2 mm. long, somewhat broader, with dorsal ribs prominent and more obtuse than in *H. umbellata.*

Type locality, marshes "about San Francisco;" collected by *Kellogg* in 1854; type in Herb. Calif. Acad.

In the region about San Francisco, Cal., and said to occur in Texas and Mexico; possibly also represented in Arizona by the form referred to below.

Specimens examined:

CALIFORNIA: Mission Bridge, San Francisco, *Kellogg;* San Francisco, *G. R. Vasey* 221, July, 1880; Elk Grove, Lower Sacramento, *Drew*, in 1888; San Francisco, *Brandegee*, July, 1891; Bouldin Island, San Joaquin River, *Brandegee*, September 7, 1892.

Numerous Californian specimens have been referred to this species, which seem to belong more properly either to *H. umbellata* or *H. cuneata.* Specimens from wet land on the shore of Silver Lake, near Tucson, Ariz. (*Pringle* in 1881 and *Dewey* in 1891), seem to represent a form of this species, in which the axis of inflorescence is elongated, the whorls being distant and few-flowered, and the pedicels are longer than we have seen in Californian specimens. We have not been able to confirm the statement that the species occurs in Texas and Mexico.

3. **Hydrocotyle canbyi** C. & R. Bot. Gaz. **12**: 103. 1887.

H. umbellata ambigua Gray, Man. ed. 5. 190. 1867, not *H. ambigua* Pursh.

H. ambigua B. S. P. Prel. Cat. N. Y. 21. 1888.

Umbels 3 to 9-flowered, generally proliferous; pedicels very short, but distinct; fruit slightly notched, 2 mm. long and about 4 mm. broad, much more flattened than in the preceding forms; dorsal and lateral ribs much more prominent, the former acutish.

Type locality, "Maryland;" type in Herb. Gray.

New Jersey to Maryland.

Specimens examined:

Delaware: Collins Beach, *Commons*, July 6, 1874.
Maryland: Ocean City, *Canby*, August, 1874.

4. **Hydrocotyle bonariensis** Lam. Encycl. **3**: 153. 1789.

H. bonariensis texana C. & R. Bot. Gaz. **15**: 259. 1890.

Umbels profusely branching and proliferous; pedicels slender, more or less elongated, sometimes 2 cm. long; fruit slightly notched, 2 mm. long, 3 mm. broad.

Type locality, "pres de Buenos-Ayres."

From North Carolina to Florida and Texas; a South American and Mexican species, and often a ballast plant.

Specimens examined:

North Carolina: Ballast dumps at Wilmington, *Biltmore Herb.* 5708, July 2, 1897.
Florida: Dry grassy ground, Pensacola, *Curtiss* 5922, July 3, 1897.
Mississippi: Biloxi, Harrison County, *Pollard* 1153, August 1, 1896.
Texas: *Lindheimer*, October, 1847 (under *H. umbellata*); Devils River, *Havard* 139, July, 1883; *Nealley*, in 1888; Industry, *Wurzlow*, in 1895.

Most of the so-called proliferous forms of *H. umbellata* throughout the South and Southwest and on ballast heaps seem to belong to *H. bonariensis*.

5. **Hydrocotyle verticillata** Thunberg, Diss. **2**: 415. pl. 3. 1800.

H. interrupta Muhl. Cat. 29. 1813.

Umbels few-flowered, proliferous, forming an interrupted spike; pedicels very short or none; fruit 2 mm. long, 3 mm. broad, truncate or rounded at base, with dorsal and lateral ribs very prominent, the former acute.

Type locality unknown.

From Massachusetts to Florida, west to central Texas and Arkansas.

Specimens examined:

New Jersey: Cape May, *Canby*, July, 1866.
Virginia: Hampton, *Steele*, August, 1895.
North Carolina: Near Clarkton, *Biltmore Herb.* 2542*a*, June 25, 1897.
South Carolina: Near Aiken, *Ravenel*.
Florida: Hibernia, *Canby*, March, 1869; St. Johns River above Palatka, *Curtiss* 992; *Otto Vesterlund*, in 1889; near Jacksonville, *Curtiss* 4333, 4963, May 30, 1893, and June 29, 1894; Palm Beach, *Canby*, March 29, 1895; Lake City, Columbia County, *Nash* 2485, August 29–31, 1895.
Mississippi: Biloxi, *Tracy* 4471, May 26, 1898.
Texas: Hempstead, *Hall* 239, May 28, 1872; Houston, *L. F. Ward*, September 12, 1877; Gillespie County, *Jermy*; Dove Creek, Tom Green County, *Tweedy* 190, May, 1880; Concho, *Havard*, June, 1881.
Arkansas: Spirit Lake, Lafayette County, *A. A. & E. Gertrude Heller* 4113, August 18, 1898.

Google

— 6. **Hydrocotyle australis** C. & R., sp. nov.

H. canbyi Britton & Brown, Ill. Fl. **2**: 540. 1897, as to habit sketch, not as to description.

Umbels few-flowered, proliferous, with 3 to 6 verticils, sometimes slightly branched; pedicels 2 to 4 mm. long; fruit 2 mm. long, slightly broader, rounded at base.

Type locality, shore of Lake Worth, Florida; collected by *Curtiss*, no. 5376, in 1895; type in U. S. Nat. Herb.

Virginia (Dismal Swamp), Florida, Texas.

Specimens examined:

VIRGINIA: Dismal Swamp, *Pollard* 871, May 30, June, 1896.

FLORIDA: *Chapman;* near Jacksonville, *Curtiss* 992, 4964; shore of Lake Worth, *Curtiss* 5378, May 8, 1895.

MISSISSIPPI: Horn Island, *Tracy* 4443, June 1, 1898.

TEXAS: Del Rio, *Nealley* 244, September, 1890; river near San Antonio, *Dewey*, June 11, 1891; near Kerrville, Kerr County, *Heller* 1935, June 26–30, 1894.

7. **Hydrocotyle cuneata** C. & R., sp. nov. FIG. 1.

Umbels few-flowered, proliferous, sometimes slightly branching; pedicels very short; fruit 2 mm. long, 3 to 4 mm. broad, tapering to the pedicel by a very distinct cuneate base.

Type locality, Montezuma Well, Arizona; collected by *D. T. MacDougal*, no. 575, in 1891; type in U. S. Nat. Herb.

Western Texas to southern California and extending northward to the region about San Francisco.

Specimens examined:

TEXAS: New Braunfels, *Lindheimer* 1, June, 1847.

NEW MEXICO: *Wright* 1383.

ARIZONA: *Palmer*, in 1869; Sanoita Valley Springs, *Lemmon* 2710, June, 1882; Montezuma well, *MacDougal* 575, August 7, 1891; Catalpa, *MacDougal*, September, 1891.

CALIFORNIA: Suisun Marsh, Solano County, *Greene*, in 1883; San Luis Obispo, *Lemmon* 57, June, 1887; Colorado Desert, San Diego County, *Orcutt*, April, 1889; Santa Barbara, *Mrs. Bingham;* Sonoma Creek, *Mrs. Hutchings*, August, 1898.

— 8. **Hydrocotyle americana** L. Sp. Pl. 1: 234. 1753.

Stems filiform, branching and creeping, often bearing small fusiform tubers; leaves thin, round reniform, crenate-lobed and lobes crenate, shining; few-flowered umbels axillary and almost sessile; fruit about 1 mm. broad, with evident ribs and no oil-bearing layer; seed section broadly oval.

Type locality, "septentrionalis America;" collected by *Kalm.*

From northeastern Canada to Minnesota and south to the mountains of North Carolina.

Specimens examined:

CANADA: Bass River, New Brunswick, *Fowler*, August 9, 1875.

MAINE: Foxcroft, valley of Piscataquis River, *Fernald* 320, July 23, 1895.

MASSACHUSETTS: Amherst, *Mrs. A. F. Stevens*, July 2, 1895.

CONNECTICUT: Greens Farms, *Pollard* 224, August 7, 1894; Fairfield and Mitford, *Eames*, in 1894 and 1895.

Rhode Island: Providence, *W. W. Bailey*, in 1874.
New Jersey: Fort Lee, *Van Sickle*, July 12, 1894.
District of Columbia: Near Washington, *Vasey*, September 20, 1885; near Takoma, *Pollard* 471, July 10, 1895.
North Carolina: Buncombe County, *Biltmore Herb.* 4003*a*, June 27, 1898.
New York: Oswego County, *Sheldon*, August 13, 1883; near Ithaca, *Coville*, in 1885 and 1886; near Ithaca, *Wiegand*, July 5, 1893.
Wisconsin: Rock Creek, *Vasey*, in 1872; St. Croix Falls, *Sheldon*, September, 1893.

9. **Hydrocotyle ranunculoides** L. f. Suppl. 177. 1781.
H. natans Cyrilli, Pl. Rar. Neap. 1: 20. pl. 605. 1892.

Floating or creeping in mud; leaves thicker, round reniform, 3 to 7 cleft, with crenate lobes; peduncles, 2.5 to 7.5 cm. long, reflexed in fruit; capitate umbel 5 to 10-flowered; fruit, 2 to 3 mm. broad, with rather obscure ribs, and no layer of strengthening cells about the seed cavity; seed section oblong.

Type locality, "Mexico."

Eastern Pennsylvania to Florida, thence westward to Texas, California, and Washington.

Specimens examined:
Pennsylvania: Near Wrightsville, York County, *Reed*, July 7, 1890.
District of Columbia: Near Bennings Bridge, *Vasey*, in 1874; between Georgetown and Chain Bridge, *Vasey & Coville*, July 15, 1888.
Maryland: Great Falls of the Potomac, *Pollard*, July 4, 1896.
Virginia: near Alexandria, *Rose & Coville*, May 24, 1890; Four Mile Run, *Steele*, July 31, 1896.
Florida: Near Apalachicola, *Curtiss* 5888, June 12, 1897; *Chapman*.
New Mexico: *Wright* 1102, in 1851.
California: Near San Francisco, *Wilkes Exped.* 1460; same station, *Vasey* 220, July, 1880; *Lemmon* 63, in 1889; Los Angeles County, *Hasse*, August 26, 1890; San Bernardino County, *Parish*, June 20, 1891; near San Jose, *Jepson*, May 28, 1896; near San Francisco, *Alice Eastwood*, July, 1896.
Oregon: Near Portland, *Henderson* 368, in 1886.
Washington: Near Seattle, *Piper* 639, September 8, 1889.

2. **CENTELLA** L. Pl. Rar. Afr. 28. 1760; Amoen. Acad. 6: 112. 1764.

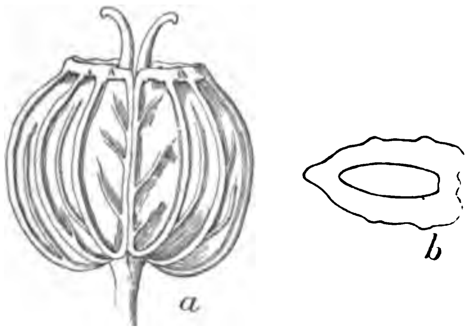


Fig. 2.—Centella asiatica: *a*. × 8; *b*. × 10.

Calyx teeth obsolete. Fruit orbicular to reniform, strongly flattened laterally. Carpel with 5 primary ribs and prominent secondary ribs and reticulations, the dorsal marginal and filiform; an oil-bearing layer beneath the epidermis, occasionally containing small oil tubes, and a thick layer of strengthening cells surrounding the seed cavity.

Perennial herbs, growing in or near the water, with slender creeping stem, reniform or ovate-cordate leaves, and small white flowers in simple umbels with conspicuous involucre.

Type species, *C. villosa* L.

A genus of both hemispheres containing about 20 species, one of which is found in southern United States.

1. **Centella asiatica** (L.) Urban in Mart. Fl. Bras. **11**^{1}: 287. 1879.

FIG. 2.

Hydrocotyle asiatica L. Sp. Pl. **1**: 234. 1753.
H. repanda Pers. Syn. **1**: 302. 1805.
Glyceria repanda Nutt. Gen. **1**: 177. 1818.
Chondrocarpus repandus Nutt. Gen. **2**: in "Errata."

Smooth or somewhat pubescent; petioles (7.5 to 10 cm. or even 30 cm. long) and peduncles (7 cm. or less long) clustered on creeping stems or runners; leaves ovate-cordate, repand-toothed, thickish; the 2 to 4-flowered umbel subtended by an involucre of two conspicuous bracts; seed section narrowly oblong.

Type locality, "India."

Maryland to Florida and west to Texas.

Specimens examined:

MARYLAND: Ocean City, *Chickering*, September 12, 1878.

FLORIDA: Near Apalachicola, *Chapman*; St. Johns River above Palatka, *Curtiss* 992; Tampa, *Garber*, May, 1876; near Jacksonville, *Curtiss* 4332, 4961, May 9, 1893, and June 18, 1894; Duval County, *Fredholm*, July 1, 1893; near Eustis, Lake County, *Nash* 1031, June 16–30, 1894.

GEORGIA: *Durand*.

ALABAMA: *Drummond*, in 1832.

MISSISSIPPI: Horn Island, and Petit Bois Island, *Tracy*, May and June, 1898.

LOUISIANA: Lake Charles, *Daves*, in 1889.

TEXAS: *Lindheimer* 613. in 1847; Hempstead, *Hall* 241, June 10, 1872; near Hockley, *Thurow*, September, 1890.

The Asiatic specimens we have seen differ somewhat from the American forms, which may prove to be a distinct species.

Centella asiatica floridana C. & R.

Hydrocotyle asiatica floridana C. & R. Rev. N. Am. Umbell. 136. 1888.

Petioles 2.5 cm. long or less, making the leaves appear in rather close clusters along the rootstock, more or less pubescent; fruit somewhat larger and more or less pubescent.

Type locality, shore of St. Johns River near Jacksonville, Fla.; collected by *A. H. Curtiss*, no. 988; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Florida; also in the West Indies and Central America.

Specimens examined:

FLORIDA: *Curtiss* as cited under type locality.

3. **BOWLESIA** Ruiz & Pav. Prodr. Fl. Peruv. 44. pl. 34. 1794.

Calyx teeth rather prominent. Fruit broadly ovate, with narrow commissure (carpels appearing nearly distinct) and stellate pubescence.

Carpel turgid, becoming depressed on the back, with neither ribs nor oil tubes; the whole dorsal region inflated, the seed cavity being on the commissural side of the carpel section. Seed flattened dorsally; the face and back, plane or convex.

Slender branching annuals, with stellate pubescence, opposite simple (lobed) leaves, scarious lacerate stipules, and simple few-flowered umbels of white flowers on axillary peduncles.

Type species, *B. palmata* Ruiz & Pavon, Fl. Peruv. **3**:28. pl. 251. 1802.

A genus of about 20 species, chiefly South American.

Our generic characters are drawn chiefly from our own species, and do not entirely apply to all the South American forms.

1. **Bowlesia septentrionalis** C. & R., sp. nov. FIG. 3.

Weak, 5 cm. to 3 or even 6 dm. long, dichotomously branching; leaves thin cordate to reniform, 1.5 to 3 cm. broad, 3 to 5 lobed (lobes entire or toothed), on long, slender petioles; umbels 1 to 4 flowered, on short peduncles; fruit about 2 mm. long, sessile or nearly so.

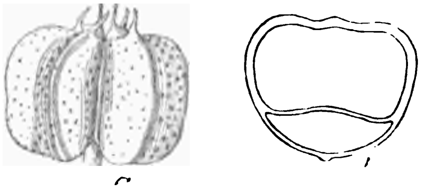


FIG. 3.—Bowlesia septentrionalis: *a*, *b*, ×8.

Type locality, near Tucson, Arizona; collected by *Myrtle Zuck*, May 16, 1896; type in U. S. Nat. Herb.

From Texas to southern California and north to the Sacramento Valley.

Specimens examined:

TEXAS: *Mex. Bound. Surv.* 410; near Austin, *Hall*, May 18, 1872; near Galveston, *Joor*, April, 1877; San Antonio, *Havard*, March, 1884; Round Rock, *Bodin*, January, 1890; Austin, *Bodin*, in 1891; Corpus Christi, *Heller* 1493, March 23–30, 1894.

ARIZONA: Verde Mesa, *Smart* 128, in 1867; banks of the Rillita, *Pringle*, April 10, 1881; Tucson, *Parish*, April, 1884; same station, *Toumey* 193, April 12, 1892; type specimens as cited under type locality.

CALIFORNIA: Monterey, *Mex. Bound. Surv.*, in 1850; near Fort Tejon, *Xantus de Vesey*, in 1857–58; *Bolander* 4633, in 1866; Humboldt, *Kellogg & Harford* 297, in 1868–69; San Diego, *Jones* 3065, March 14, 1882; Santa Monica, *Hasse*, April, 1891; Caliente, Kern County, *Brandegee*, April 4; Drytown, Amador County, *Hansen* 1561, April 8, 1896; near San Jacinto, *Leiberg* 3221, April 1, 1898.

Urban, in *Flora Brasiliensis*, states that the above forms are not *B. lobata* Ruiz & Pavon, as they have long been called, but refers them to *B. tenera* Spreng., which he makes a variety of *B. incana* Ruiz & Pavon. In many ways our plants seem nearer to *B. tenera* Spreng. than to any other described species, but that is a Brazilian form. They were taken by Nuttall to represent a good species, and are so labeled in the Philadelphia Academy, but his name is not now tenable.

4. **SANICULA** L. Sp. Pl. 1: 235. 1753.

Calyx teeth somewhat foliaceous, persistent. Fruit subglobose, densely covered with hooked bristles or tuberculate. Carpel with neither ribs nor strengthening cells. Stylopodium wanting. Oil tubes mostly large, 5 (3 dorsal and 2 commissural), or 3 to many irregularly distributed. Seed face from plane to deeply concave or sulcate.

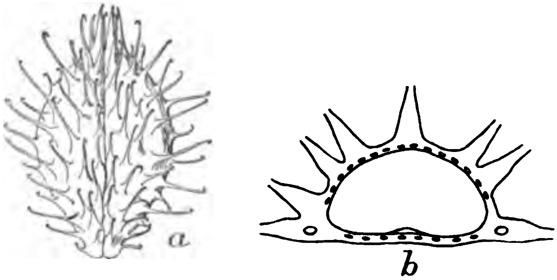


FIG. 4.—Sanicula trifoliata: *a*, × 4; *b*, × 10.

Smooth perennials, with almost naked or few-leaved stems, mostly palmate (pinnate in a few species) leaves with more or less pinnatifid or incised lobes, involucre and involucels present, and greenish-yellow or purple flowers in irregularly compound few-rayed umbels.

First species cited, *S. europaea* L.

A group of about 30 species belonging to both hemispheres, 18 of which occur in the United States and Canada.

Atlantic species; oil tubes 5 (except in *S. trifoliata*).

Styles much longer than the bristles; sterile flowers often in separate umbellets.

Fruit not stipitate; bristles bulbous at base .... 1. *S. marilandica.*

Fruit stipitate; bristles not bulbous at base .... 2. *S. gregaria.*

Styles shorter than the bristles; sterile flowers intermixed with the fertile, not in separate umbellets.

Oil tubes 5.

Fruit stipitate .... 3. *S. canadensis.*

Fruit not stipitate .... 4. *S. smallii.*

Oil tubes numerous .... 5. *S. trifoliata.*

Pacific species; oil tubes irregular in number and distribution.

Mature fruit pediceled or stipitate.

Involucels small.

Fruit bristly all over; leaves not with conspicuously winged rachis. 6. *S. menziesii.*

Fruit naked (at least less bristly) below; leaves with conspicuously winged rachis .... 7. *S. arguta.*

Involucels conspicuous .... 8. *S. arctopoides.*

Mature fruit neither pediceled nor stipitate.

Leaves palmate in type.

Leaves palmately divided.

Leaves with main divisions confluent at base.

Involucels conspicuous .... 9. *S. howellii.*

Involucels small .... 10. *S. laciniata.*

Leaves with main divisions distinct at base.

The numerous peduncles arising in a cluster from near the base. 11. *S. nevadensis.*

Peduncles arising singly along the stem .... 12. *S. septentrionalis.*

Leaves not palmately divided .... 13. *S. maritima.*
Leaves more or less pinnately divided.
  Stems not arising from tubers.
    Leaves with winged rachis.
      Rachis toothed; flowers purple (rarely yellow) ...... 14. *S. bipinnatifida.*
      Rachis entire; flowers yellow .... 15. *S. nemoralis.*
    Leaves without winged rachis.
      Leaves twice or thrice pinnate .... 16. *S. bipinnata.*
      Leaves ternate, then pinnate .... 17. *S. saxatilis.*
  Stems arising from tubers .... 18. *S. tuberosa.*

1. **Sanicula marilandica** L. Sp. Pl. 1: 235. 1753.

S. canadensis marylandica Hitchcock, Trans. St. Louis Acad. 5: 497. 1891.

Mostly simple below and umbellately branching above, 4.5 to 12 dm. high; basal leaves 3 to 5-parted, the lateral leaflets divided nearly to the base, giving the appearance of a 5 or 7-parted leaf; the divisions mostly sharply cut and serrate, the teeth more or less mucronate tipped; upper leaves similar, but with shorter petioles, becoming sessile or nearly so above; umbellate peduncles 2 to 4, nearly equal, sometimes becoming 2 dm. long; umbels nearly regular, with 3 to 7 rays, involucre of few leaf-like or small bracts, and involucels of few small bractlets; sterile flowers numerous, either intermixed with the fertile or in separate umbellets; calyx of sterile flowers 2 mm. long, cleft below the middle, the lobes acute; fruit sessile, oval, 6 to 7 mm. long, including bristles (bulbous at base); commissural scar elliptical; seed face plane or slightly concave.

Type locality, "Marilandia, Virginia."

From Newfoundland to Georgia and westward to Colorado, northwestern Idaho, and Alberta.

Specimens examined: Among the very numerous specimens examined we cite only those from well-known sets.

Newfoundland: Exploits River, *Robinson & Schrenk*, August 13, 1894.
Maine: Dover, Piscataquis County, *Fernald* 235, June 26, 1895.
Vermont: Manchester, *M. A. Day* 353, June 29, 1898.
Connecticut: Milford, *Eames*, September 13, 1893.
Georgia: Augusta, *McCarthy* 11, June, 1888.
South Dakota: Elk Canyon, *Rydberg* 731, June 29, 1892.
Colorado: Durango, *Tweedy* 87A, July, 1896.
Montana: Near Bozeman, *Rydberg* 681, July 7, 1896.
Idaho: Lake Pend Oreille, *Sandberg* 763, July 28, 1892.
Alberta: St. Marys River, *Macoun* 10653, July 22, 1895.

2. **Sanicula gregaria** Bicknell, Bull. Torr. Bot. Club 22: 354. 1895.

Like *S. marilandica*, but calyx of sterile flowers 1 mm. long, cleft to the middle, the lobes obtuse; fruit sessile but stipitate, 3 mm. long including bristles (not bulbous at base); commissural scar linear.

Type locality, "Van Cortlandt Park," New York City; collected by *Bicknell;* type in Herb. Columbia Univ.

From New Hampshire to North Carolina, and west to Ontario, Minnesota, Nebraska, and Arkansas.

Specimens examined:

NEW HAMPSHIRE: Walpole, *Fernald* 50, August 8, 1899.
ONTARIO: Near Ottawa, *Macoun* 4976, August 4, 1894.
NEW YORK: Near Ithaca, *Coville*, June 21, 1885; between the Hudson and Bronx rivers, *Bicknell*, September 4, 1892, and July 28, 1895.
DISTRICT OF COLUMBIA: Chevy Chase road, *Pollard* 280, May 26, 1895.
VIRGINIA: Near Belfield, Greenville County, *Heller* 998, June 19, 1893.
NORTH CAROLINA: Near Biltmore and slopes of Busbee Mountain, *Biltmore Herb.* 882, 4816, in 1896 and 1897.
WEST VIRGINIA: Near Sago, Upshur County, *Pollock*, May 18, 1895.
OHIO: Near Salem, *Wilkinson*, June, 1887.
MISSOURI: Near Independence, *Bush* 663, 730, June 9–July 13, 1896.
IOWA: *Fink*, in 1894.
NEBRASKA: Ponca, *Clements* 2559, June 15, 1893.
MINNESOTA: Near Winona, *Holzinger*, June 19, 1889; Fort Snelling, *Mearns*, June 3, 1891.

3. **Sanicula canadensis** L. Sp. Pl. 1: 235. 1753.

S. marylandica canadensis Torr. Fl. U. S. 302. 1824.
S. floridana Bicknell, Bull. Torr. Bot. Club **24**: 581. 1897.

From slender and nearly simple to stout and much branched, 3 to 12 dm. high, the branching mostly alternate and dichotomous; basal leaves palmately 3-parted, the lateral leaflets divided nearly to the base, giving the appearance of a 5-parted leaf; the divisions mostly sharply cut and serrate, the teeth more or less mucronate-tipped; upper leaves similar, but with shorter petioles, becoming sessile or nearly so above; umbels irregular, one to few-rayed, with involucre of few leaf-like or small bracts, and involucels of few small bractlets; sterile flowers few and on short pedicels; fruit sessile, but distinctly stipitate, suborbicular, 3 to 6 mm. long (including bristles), the calyx inconspicuous among the bristles; styles shorter than the calyx; seed-face convex.

Type locality, "Virginia."

From Vermont to Florida, and westward to Nebraska, Kansas, and Texas.

Specimens examined: Among the various numerous specimens examined we cite only those from well-known sets.

NEW YORK: Between the Hudson and Bronx rivers, *Bicknell*, October 14, 1894.
PENNSYLVANIA: Near mouth of Tucquan, Lancaster County, *A. A. Heller & E. Gertrude Heller*, September 12, 1891.
VIRGINIA: Near Belfield, Greenville County, *Heller* 982, June 19, 1893.
WEST VIRGINIA: Near Oceana, Wyoming County, *Morris* 1330, August 22, 1900.
GEORGIA: On Little Stone Mountain, Dekalb County, *Small*, July 25, 1893.
ALABAMA: Auburn, Lee County, *Earle & Baker*, May 28, 1898; Lee and Madison Counties, *Pollard & Maxon* 38, 84, 379, July 9–August 1, 1900.
TENNESSEE: Knox County, *Kearney*, July 9, 1894; Wolf Creek, Cocke County, *Kearney* 709, September 2, 1897.
KENTUCKY: Cliffs of Kentucky River, *Rose*, August 15, 1895.
MISSOURI: Courtney, Jackson County, *Bush* 709, July 14, 1896.
KANSAS: Near Osborne City, *Shear* 173, July 20, 1894; Cowley County, *White*, June 28, 1898.

TEXAS: "Fort Smith to the Rio Grande," *Bigelow*, July 22, 1853.

Mr. E. P. Bicknell based his *S. floridana* upon the Duval County specimens of *Curtiss* (no. 994). This plant appears to be distinct enough, but on account of numerous intergrading forms, covering a wide range and frequently associated with true *S. canadensis*, we can not separate the two. The *floridana* forms, extending from Florida to Arkansas and eastern Texas and north to North Carolina and Kentucky, seem to be associated with dry sandy ground conditions. Among these are the following: *Coville* 92, near Argenta, Ark., July 14, 1887; *Rose*, in the Green River region of Kentucky, August 21, 1895; *Biltmore Herb.* 3408*a*, near Wrightsville, N. C., July 1, 1897; *Rose* 4167, near Houston, Tex., May 6, 1899.

4. **Sanicula smallii** Bicknell, Bull. Torr. Bot. Club **24**: 578. 1897.

In habit resembling the simpler forms of *S. canadensis*, the mostly simple stem being once or twice dichotomously branched; fruit larger, 5 to 6 mm. long (including the bristles), not at all stipitate; styles a little longer than the calyx; otherwise as in *S. canadensis*.

Type locality, "base of Little Stone Mountain," Georgia; collected by *John K. Small*, June 1893; type in Herb. Columbia Univ.

Tennessee, Alabama, Georgia, and Florida.

Specimens examined:

TENNESSEE: Along Wolf Creek, Cocke County, *Kearney* 710, September 2, 1897.

ALABAMA: Montesano, near Huntsville, Madison County, *Pollard & Maxon* 377, August 1, 1900.

GEORGIA: Base of Little Stone Mountain, Dekalb County, *Small*, July 25, 1893.

FLORIDA: Tallahassee, *Nash* 2362, August 7–9, 1895.

The only two characters, as given by Mr. Bicknell, which do not break down in separating this species from *S. canadensis* are the longer styles and the fruit not all stipitate. As these two characters look toward *S. marilandica* they suggest that *S. smallii* may possibly be a hybrid of *S. canadensis* and *S. marilandica*.

5. **Sanicula trifoliata** Bicknell, Bull. Torr. Bot. Club **22**: 359. 1895.
FIG. 4.

Similar in habit to *S. canadensis;* sterile flowers on pedicels 4 to 5 mm. long; fruit not stipitate, elliptical, 6 to 7 mm. long including the calyx, which forms a conspicuous beak about as long as the bristles; commissural scar very broad; seed-face slightly concave.

Type locality not given, the species being based upon specimens from Indiana, Ohio, Connecticut, and Canada; type in Herb. Columbia Univ.

From Maine to Connecticut and west to Ontario, Indiana, and West Virginia.

Specimens examined:

MAINE: Manchester, *Scribner*, in 1873.

VERMONT: Near Manchester, *M. A. Day* 354, June 27, 1898.

NEW YORK: Near Ithaca, *Coville*, July 26, 1885; Yonkers, *Bicknell*, September 22, 1895.

WEST VIRGINIA: Quinnimont, *Pollard & Maxon* 14, August 21, 1899; near Hinton, Summers County, *Morris* 961, July 9, 1900.

OHIO: Pittsfield, Lorain County, *Ricksecker*, July 9, 1894.

A very distinct species, and differing from all other Eastern forms in its numerous oil tubes.

6. **Sanicula menziesii** Hook. & Arn. Bot. Beechey 142. 1832.

Sanicula nudicaulis Hook & Arn. Bot. Beechey 347. 1840.

Stem solitary, erect, 3 to 10.5 dm. high, branching; leaves round-cordate, 5 to 10 cm. broad, very deeply 3 to 5-lobed, the broad segments sharply toothed or somewhat cleft, the teeth bristle-tipped; upper leaves more narrowly lobed and laciniately toothed; umbel with 3 or 4 slender rays, involucre of 2 or 3 small leaf-like bracts, and involucels of 6 to 8 small entire bractlets; flowers yellow, the sterile ones short-pediceled; fruit sessile, but distinctly stipitate, obovate, 2 to 4 mm. long, covered with strong bristles; seed face sulcate.

Type locality not given; but collected by *Menzies* on the "Northwest coast of America," according to Hooker.

From southern California to Vancouver Island and the coast of British Columbia.

Specimens examined:

CALIFORNIA: *Douglas*, in 1833; *Bigelow*, in 1853–54; *Bolander*, in 1866; San Francisco, *Kellogg & Harford* 301, April 30, 1868; Berkeley, *G. R. Vasey*, May 19, 1875; San Luis Obispo, *Jones* 2735, May 9, 1882; Berkeley, *Greene*, May 20, 1889; San Diego County, *Orcutt*, May, 1889; Los Angeles, *Hasse*, May, 1892; San Bernardino Mountains, altitude 500 to 750 meters, *Parish* 3480, 4166, in 1894 and 1896; Little Chico Creek, *Mrs. R. M. Austin*, May, 1896; Amador County, *Hansen* 75, April 29, 1893, and 1451, 1559, 1655, April and May, 1896; Santa Catalina Island, *Blanche Trask*, June, 1897; near San Bernardino, *Leiberg* 3322, April 25, 1898; Mendocino county, *Brown* 825, June, 1898.

WASHINGTON: Columbia River, Klickitat County, *Suksdorf*, May 6–25, 1885; Seattle, *Piper* 643, May 29, 1889; Thurston and King counties, *Henderson*, June, 1892.

BRITISH COLUMBIA: Nanaimo, Vancouver Island, *Macoun*, June 9, 1887.

Professor Greene prepared the following note when at Kew in November, 1894. "*Sanicula nudicaulis* a miserable specimen of *S. menziesii* with stout main stem broken off and thrown away to save space; two abnormal scapiform subbasal branches, with each a pair of opposite leaves subtending condensed and abnormal inflorescence. Hooker did not compare it with *laciniata*, but mounted it on the same sheet with *menziesii*, where it belongs."

7. **Sanicula arguta** Greene, sp. nov. in herb.

Stems more or less branching, 1.5 to 4.5 dm. high, from a thickened rootstock; leaves palmately 5-parted, the middle division elongated and distant, all the divisions more or less pinnately lobed and toothed, decurrent upon the rachis, forming a broad toothed wing; teeth spinosely pointed; umbel 3 to 5-rayed, with involucre of leaf-like bracts, and involucels of linear to linear-lanceolate spinosely pointed bractlets; flowers yellow, the sterile ones on pedicels 3 to 4 mm. long; fruit obovate, tapering into a stipitate base, somewhat naked below, more bristly above, 6 mm. long.

Type locality, hills near San Diego, California; collected by *C. G. Pringle*, 1882; type in U. S. Nat. Herb.

Southern California.

Specimens examined:

CALIFORNIA: Monterey, *Parry*, in 1850; San Diego, *Orcutt* 112, March, 1882; San Luis Obispo, *Mrs. R. W. Summers*, March, 1882; San Diego, *Jones* 3149, April 19, 1882; same station, *Pringle*, May 6, 1882; Oakland Hills, *Lemmon* 14, April, 1889; Los Angeles, *Hasse*, April, 1888, and May, 1892; San Ysabel, *Henshaw* 201, March 29, 1893; Santa Catalina Island and San Nicholas Island, *Blanche Trask*, April, 1896 and 1897.

8. **Sanicula arctopoides** Hook. & Arn. Bot. Beechey 141. 1832.

Stems very short, from thickened rootstocks, bearing a tuft of leaves and several (often much longer) divergent scape-like branches 5 to 30 cm. long, each bearing an umbel of 1 to 4 elongated rays; leaves deeply palmately 3-lobed, the cuneate divisions once or twice laciniately cleft, usually dissected into lanceolate acute spreading segments; involucre of 1 or 2 similar leaf-like bracts; umbellets large, 6 to 12 mm. in diameter, with conspicuous involucels of 8 to 12 narrowly oblanceolate mostly entire bractlets much exceeding the yellow flowers; fruit short-pediceled, 2 to 3 mm. long, naked at base, with strong bristles above; seed face almost plane.

Type locality not given; but collected by *Menzies* on the "Northwest coast of America," according to Hooker.

From southern California to Vancouver Island and the coast of British Columbia.

Specimens examined:

CALIFORNIA: *Thomas Coulter* 204; *Bigelow*, in 1853–54; San Francisco, *Bolander*, in 1866; same station, *Kellogg & Harford* 299, in 1868–69; same station, *E. R. Drew*, March 23, 1888; same station, *Greene*, April 21, 1889; Monterey, *Cloud Rutter* 198, March 25, 1895; near Mendocino, Mendocino County, altitude 150 meters, *Brown* 734, May, 1898.

OREGON: *Mrs. Nevius.*

9. **Sanicula howellii** C. & R. Bot. Gaz. **13**: 81. 1888.

Stems coarse, 3 dm. or less high, more or less buried in the sand, often bearing tufts of stout elongated peduncles and leaves; leaves broad and palmately 3 to 5-lobed (often much modified by burial in the sand), the upper inclined to be pinnately lobed, the divisions rather sharply cut and toothed, the teeth mucronate-tipped; umbels unequally few-rayed, with involucre of few leaf-like bracts, and involucels of very prominent bractlets, sometimes much exceeding the large globose head of fruit; flowers yellow; fruit apparently sessile, bristly all over, 3 to 4 mm. long; seed face concave.

Type locality, "sandy shores, Tilamook Bay and Ocean Beach, Oregon"; collected by *Howell*, no. 16, July 15, 1882; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

From the coast of Oregon to Vancouver Island.

Specimens examined:

OREGON: Type specimen, as cited under type locality; same station and date, *Henderson* 1584; same station, *Howell* 1365, May 14, 1887, and in 1888.

WASHINGTON: Shores of Puget Sound, *Wilkes Exped.* 71.

BRITISH COLUMBIA: Beacon Hill, Vancouver Island, *Macoun*, May 25, 1887.

10. **Sanicula laciniata** Hook. & Arn. Bot. Beechey 347. 1840.

Usually slender plants, 1 to 6 dm. high; leaves broadly ovate to orbicular in outline, from slightly 3-lobed to deeply 3-parted, the divisions from toothed to laciniately cut, with bristle-tipped teeth; umbel 3 to 5-rayed, with involucre of leaf-like bracts, and involucels of small lanceolate apiculate bractlets; flowers yellow; fruit orbicular, not at all stipitate, 3 mm. long.

Type locality, in California; collected by *Douglas*.

From Mendocino County to San Diego County, Cal.

Specimens examined:

CALIFORNIA: *Bigelow*, in 1853–54; Sonoma County, *E. Samuels* 88; *Kellogg & Harford* 298, March 31, 1869; Santa Rosa, Sonoma County, *Holman*, March, 1884; Mount Tamalpais, near San Francisco, *Greene*, March 30, 1889; San Rafael, Marin County, *Lemmon* 30, in 1889; San Diego, *Dunn*, March 27, 1891; Bolinas Ridge, Marin County, *Palmer* 2302, June 14–16, 1892; San Diego County, *Alderson*, March, 1894; Mendocino County, *Brown* 705, May, 1898.

Hooker's American species of Sanicula were referred to Mr. Pearson, of Kew. His full report has not reached us, but his brief synopsis received while reading page proof justifies our exclusion of *S. nudicaulis* from *S. laciniata*.

11. **Sanicula nevadensis** Watson, Proc. Am. Acad. **11**: 139. 1876.

Low, with very short stems, the numerous stoutish peduncles arising from near the base, 2 dm. or less high; leaves ternate, the divisions oblong-ovate, 3 to 5-lobed; the segments lobed or toothed; umbels with 3 to 10 rays, involucre of pinnatifid leaf-like bracts, and involucels of small oblong acute more or less united bractlets; fruiting rays 1.5 to 3.5 cm. long; flowers yellow, the sterile ones on pedicels 2 to 3 mm. long; fruit bristly all over, 3 mm. long; seed face concave.

Type locality, "Plumas County, Cal.;" collected by *Mrs. M. E. P. Ames* and by *Lemmon;* type in Herb. Gray.

Mountains of eastern California.

Specimens examined:

CALIFORNIA: Plumas County, *Mrs. M. E. P. Ames*, in 1872; same station, *Lemmon*, in 1875 and 1889; Siskiyou County, *Greene* 741, in 1876; Hornbrook, Stanislaus County, *Howell* 1364, April 16, 1889; Sierra County, *Sonne* 357, June 5, 1892; Modoc County, *Baker*, June–August, 1893; San Bernardino Mountains, altitude 1,800 meters, *Parish* 3501, June 26, 1894; Forestdale, Modoc County, *Baker & Nutting*, June 15, 1894; San Bernardino Mountains, *Parish* 3762, June 29, 1895; Eldorado County, *Hansen* 1116, June 13, 1895; Pah Ute Pass, altitude 1,500 to 1,800 meters, *Purpus* 5093, in 1897; San Bernardino Mountains, altitude 1,800 meters, *Leiberg* 3330, April 25, 1898.

As pointed out by Professor Greene, *S. nevadensis* has been made to include too many forms. We restrict it here to its original limitations. The more northern forms, heretofore referred to this species, will be found under *S. septentrionalis*.

12. **Sanicula septentrionalis** Greene, Erythea **1**: 6. 1893.

S. divaricata Greene, Erythea **3**: 64. 1895.

Erect, slender, from a tuberous or elongated thick root, from almost simple to divaricate branching, from 1 to 3.5 dm. high; basal leaves few and small, ternate or biternate, the obovate segments cleft or coarsely toothed; stem leaves few, mostly more sharply cleft or toothed; peduncles usually much elongated and often spreading; umbels with 3 to 5 rays, involucre of pinnatifid leaf-like bracts, and involucels of small oblong acute more or less united bractlets; fruiting rays 1.5 to 3.5 cm. long; flowers yellow, the sterile ones on pedicels 1 mm. long; fruit 4 mm. long, covered all over with long bristles; seed face plane.

Type locality, "Chase River, Vancouver Island"; collected by *Macoun*, June 4, 1887; type in Herb. Greene.

From northern California to Vancouver Island and western Montana.

Specimens examined:

CALIFORNIA: Plumas County, *Mrs. R. M. Austin*, May, 1880; Independence Lake, Nevada County, *Sonne* 8, June 26, 1892; near Castle Peak, *Greene*, July 20, 1893; Big Valley Mountains, Modoc County, *Baker & Nutting*, June 15, 1894.

OREGON: Oakland, *Howell* 181, April, 1881; ridges near The Dalles, *Howell*, June 20, 1882; sterile mountain ridges, altitude 1,800 meters, *Cusick* 960, August, 1884.

WASHINGTON: East of Cascade Mountains, *Wilkes Exped.* 834; Klickitat County, *Suksdorf* 20, April 25, 1881; Falcon Valley, *Suksdorf* 93, June, 1883; Yakima County and Kittitas County, *Henderson* 2577, August 4, 1892; *F. H. Snow*, Blue Mountains, Wallawalla County, *Piper* 2338, July 15, 1896; same station, *Horner* 214, July 29, 1897; steep dry slope in the Goat Mountains, Cascades, altitude 1,650 meters, *O. D. Allen* 254, in 1896.

IDAHO: Cuddy Mountains, *Jones*, July 1, 1899.

MONTANA: Columbia Falls, *Williams* 982, June, 1893 and 1894.

BRITISH COLUMBIA: Cedar Hill, Vancouver Island, *Macoun*, May 11, 1887; Chase River, Vancouver Island, *Macoun*, June 4, 1887; near Victoria, Vancouver Island, *Macoun* 295, May 19, 1893.

These forms have all been confused with *S. nevadensis*, although they represent a very distinct species and one well separated by Professor Greene. After an examination of Californian specimens, including Professor Greene's type of *S. divaricata*, we can not distinguish it from *S. septentrionalis*. Selected specimens of the two are quite different in habit, but these differences seem to us not at all constant, and the two have in common the more technical characters which distinguish this species from *S. nevadensis*.

13. **Sanicula maritima** Kellogg, Bot. Calif. **2**: 451. 1880.

Stems stout, 3 dm. or more high from a thickened rootstock; basal leaves long-petioled, somewhat cordate, very obtuse, entire or sparingly denticulate or crenulate, 5 to 10 cm. long, 3.5 to 4.5 cm. broad; stem leaves one or few, smaller and more or less lobed or parted (as are sometimes the basal leaves); peduncles few and elongated; umbel with 1 to 3 rays, involucre of large leaf-like lobed or parted bracts, and involucels of numerous small lanceolate bractlets; flowers in dense heads, the sterile ones short-pediceled; fruit somewhat naked below, bristly above, 3 to 4 mm. long; seed face concave, with a very prominent central longitudinal ridge.

Type locality, "near the coast about San Francisco or northward;" collected by *Kellogg*.

Coast about San Francisco, Cal.

Specimens examined:

CALIFORNIA: Alameda (type locality), *Greene*, May, 1888 and 1889; Potrero Hills, San Francisco, *Alice Eastwood*, April, 1894.

14. **Sanicula bipinnatifida** Dougl. in Hook. Fl. Bor. Am. 1: 258. pl. 92. 1834.

Stems 3 dm. or more high, from a thickened rootstock, with usually a cluster of leaves at base, and 1 to 3 leaves above; leaves pinnately 3 to 7-parted, the divisions incisely toothed or lobed, decurrent on the rachis and forming a toothed wing, teeth acute or slightly pointed; umbel with 3 or 4 elongated rays, involucre of leaf-like bracts, and involucels of small narrow acute bractlets; flowers purple (rarely yellow), in dense heads, the sterile ones pediceled; fruit bristly all over, 3 mm. long; seed face broadly concave, with a prominent central longitudinal ridge.

Type locality, "Fort Vancouver on the Columbia;" collected by *Douglas* and *Scouler;* type in Herb. Kew.

From Vancouver Island to southern California, and extending into Lower California.

Specimens examined:

CALIFORNIA: *Bigelow*, in 1853–54; Oakland, *Bolander*, in 1866; Mission, San Francisco, *Kellogg & Harford*, in 1868; Sierra Nevada Mountains, *Lemmon*, in 1875; San Diego County, *Lemmon*, June, 1884; Santa Rosa, Sonoma County, *Holman*, May, 1884; near San Diego, *Orcutt* 145, March 21, 1885; near Visalia, *Patterson*, May 17, 1886; San Bernardino County, *Parish* 1998, May, 1887; Highland Springs, *Simonds*, June, 1888; Los Angeles County, *Davidson*; Plumas County, *Lemmon*, May, 1889; San Diego County, *Orcutt*, May, 1889; San Francisco County, *Michener & Bioletti*, April, 1891; San Diego County, *Alderson*, March, 1894; San Ysabel, *Henshaw* 222, April 15, 1893; Amador County, *Hansen* 1296, 1298, April, 1894 and 1895; Goose Valley, Shasta County, *Baker & Nutting*, May 26, 1894; Little Chico Creek, *R. M. Austin* 214, April, 1896; Butte County, *Brown*, April 15–30, 1897.

OREGON: Near Cushyville, *Howell*, June 12, 1888.

WASHINGTON: Puget Sound, *Wilkes Exped.* 76.

BRITISH COLUMBIA: Cedar Hill, Vancouver Island, *Macoun*, May 24, 1887; near Victoria, Vancouver Island, *Macoun*, May 27, 1893.

15. **Sanicula nemoralis** Greene, Erythea 1: 6. 1893.

"Erect, rather slender, a foot high, from a perpendicular root; leaves mostly radical, bipinnately 3 to 7-parted, the divisions decurrent upon the rachis as a narrow entire wing; the several ascending branches bearing compound umbels with elongated rays; flowers few in the head, yellow; fruit small, broader than long, the whole surface covered with uncinate prickles which are strongly fistulate-enlarged or inflated from the base to near the middle."

Type locality, "Big Trees" and "Yosemite Valley;" collected by *Bolander;* type apparently lost.

We have not seen this plant, and hence quote Professor Greene's description, in which he says that it may "represent what has been called a yellow-flowered state of *S. bipinnatifida.*"

16. **Sanicula bipinnata** Hook. & Arn. Bot. Beechey 347. 1840.

Slender, 2 to 4 dm. high, from a slender fusiform root; leaves twice or thrice pinnate, with divisions not at all decurrent, cuneate-oblong to ovate, incisely and mucronately toothed; umbel 3 or 4-rayed, with involucre of leaf-like bracts, and involucels of a few small bractlets more or less united; flowers yellow; fruit 3 mm. long, with strong tubercles tipped with short hooked bristles; seed face deeply sulcate, sometimes inclosing a central cavity, with a central longitudinal ridge.

Type locality, in California; collected by *Douglas.*

California.

Specimens examined:

CALIFORNIA: *Thomas Coulter* 208; *Kellogg & Harford* 300, in 1868–69; *Lemmon* 65; Solano County, *Jepson*, March 24, 1892; Stanford University, *Rutter* 32, February 24, 1895; near Midway, Alameda County, *Greene*, May 3, 1895; Santa Maria, Santa Barbara County, *Ida M. Blochman* 26, April 3, 1895; Butte County, *Mrs. R. M. Austin* 249, April, 1896; Amador County, *Hansen* 1577, April 8, 1896; Santa Lucia Mountains, Monterey County, *Plaskett*, March, 1898.

17. **Sanicula saxatilis** Greene, Erythea 1:6. 1893.

Stems numerous, branching and spreading from the base, about 3 dm. long, from a thick root; leaves ternate, then pinnate, the ultimate segments broad, coarsely toothed; flowering branches repeatedly dichotomous, with pedicellate heads in the forks; involucels small, of very unequal foliaceous entire or toothed bractlets; flowers salmon color; sterile flowers on pedicels 6 mm. long; fruit 3 mm. long, strongly tuberculate, the upper tubercles tipped with a much reduced subulate and hooked bristle; seed face plane.

Type locality, "summit of Mount Diablo," California; collected by *Greene*, June, 1892; type in Herb. Greene.

Specimens examined:

Type specimen the only one seen.

18. **Sanicula tuberosa** Torrey, Pacif. R. Rep. 4^1: 91. 1856.

Stems 1 to 6 dm. high, from a small globose tuber; leaves twice or thrice pinnate, usually very finely divided, ultimate segments very small; umbel 1 to 4-rayed, with involucre of leaf-like bracts, and involucels of small unequally united bractlets; flowers yellow, the sterile ones on long pedicels; fruit broader than long, more flattened laterally than in any other species, 2 mm. long, tuberculate, and not at all bristly; seed somewhat laterally flattened, with plane face.

Type locality, "hillsides, Duffield's Ranch, Sierra Nevada," California; collected by *Bigelow;* type in Herb. Columbia Univ.

California, extending into Lower California.

Specimens examined:

CALIFORNIA: *Bigelow*, in 1853–54; *Bolander* 4644, in 1866; *Rattan* 300, in 1860–1867; Ukiah, *Kellogg & Harford* 302, May 5, 1869; Fall Brook, *Jones* 3098, March 23, 1882; Los Angeles, *Hasse*, May, 1888 and 1889; Green Horn Mountains, altitude 1,800 to 2,100 meters, Kern County, *Palmer* 48, June 7–15, 1888; Humboldt County, *Marshall*, in 1888; same station, *Chesnut & Drew;* San Rafael, *Brandegee*, April, 1889; Plumas County, *Lemmon* 31, May 28, 1889; Summit, *Greene*, July 19, 1893; Lassen County, *Baker & Nutting*, July 9, 1894; Santa Barbara County, *Ida M. Blochman*, April 3, 1895; Eldorado County, *Hansen* 1117, June 11, 1895; Butte County, *Mrs. R. M. Austin* 302, July, 1896; Amador County, *Hansen* 68, March 20, 1896.

Professor Greene regards this species as an aggregate, and the diversity in habit suggests this as a possibility. With the material at hand, however, we do not feel justified in attempting any segregation.

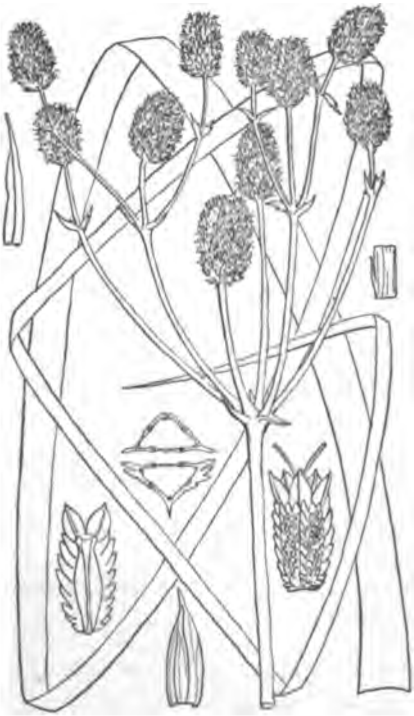


FIG. 5.—Eryngium sparganophyllum.

5. **ERYNGIUM** L. Sp. Pl. 1: 232. 1753.

Sepals very prominent, rigid, and persistent. Fruit ovoid, flattened laterally, covered with hyaline scales or tubercles. Carpel with ribs obsolete. Stylopodium wanting; styles short or long, often rigid. Oil tubes mostly 5 (3 dorsal and 2 commissural). Seed face plane.

Glabrous perennials, with leaves often rigid, coriaceous, spinosely toothed or divided, and white or blue flowers sessile in dense bracteate heads. The outer *bracts* form the involucre; the inner ones, *bractlets*, intermixed with the flowers, represent the involucels.

First species cited, *E. foetidum* L.

A group of about 200 species distributed chiefly throughout temperate and subtropical regions, 29 of which occur in the United States and Canada.

LEAVES elongated linear, coriaceous, parallel-veined, either entire or with margin sparingly bristly.
  Leaves with numerous marginal bristles.
    Marginal bristles remote and solitary .... 1. *E. yuccifolium.*
    Marginal bristles more numerous and in clusters of 2 to 4 .... 2. *E. synchaetum.*
  Leaves with no marginal bristles (rarely 1 or 2) .... 3. *E. sparganophyllum.*

- LEAVES not parallel-veined, variable in form and texture.
  - BASAL LEAVES not at all spiny-toothed.
    - Plants low and slender, mostly prostrate, with small thin leaves.
      - Bractlets longer than flowers; fruit strongly tuberculate ..... 4. *E. baldwinii.*
      - Bractlets shorter than flowers; fruit not strongly tuberculate ..... 5. *E. prostratum.*
    - Plants erect and mostly tall; leaves thick; eastern (except *E. phyteumae*).
      - Leaves elongated, the petioles long and fistulous.
        - Bractlets entire.
          - Heads oblong, with a terminal tuft of conspicuous bractlets. 6. *E. phyteumae.*
          - Heads globose, without conspicuous terminal bractlets.. 7. *E. floridanum.*
        - Bractlets 3-toothed.
          - Bractlets with unequal teeth (middle one largest) .... 8. *E. aquaticum.*
          - Bractlets with equal teeth.
            - Slender, 4.5 to 9 dm. high ..... 9. *E. ravenelli.*
            - Stout and taller (12 to 18 dm.) ..... 10. *E. mettaueri.*
      - Leaves small, with short petioles.
        - Upper leaves simple; bractlets tricuspidate ..... 11. *E. integrifolium.*
        - Upper leaves palmately parted; bractlets entire ..... 12. *E. hookeri.*
  - BASAL LEAVES spiny-toothed (sometimes reduced to nodose petioles).
    - Southern and southwestern species.
      - Heads small (12 mm. or less); sepals entire.
        - Bractlets 3-toothed ..... 13. *E. aromaticum.*
        - Bractlets entire.
          - Stems low and diffusely branching; bracts less conspicuous, green within. 14. *E. diffusum.*
          - Stem erect, less branching; bracts very conspicuous, not green within.
            - Bracts linear-lanceolate; lower leaves pectinate-dentate or with triangular bristly teeth ..... 15. *E. wrightii.*
            - Bracts broadly cuneate; lower leaves not pectinate-dentate. 16. *E. lemmoni.*
      - Heads large (25 to 35 mm. long); sepals 3 to 5-cuspidate.. 17. *E. leavenworthii.*
    - Pacific slope species.
      - Styles shorter than sepals.
        - Bracts and bractlets entire ..... 18. *E. armatum.*
        - Bracts and bractlets not entire.
          - Bractlets little longer than the usually blue heads.... 19. *E. articulatum.*
          - Bractlets twice as long as the heads, which are never blue ..... 20. *E. petiolatum.*
      - Styles longer than sepals.
        - Bractlets but little longer than flowers.
          - Bracts weak and reflexed ..... 21. *E. elongatum.*
          - Bracts rigid and not reflexed.
            - Bracts much longer than the heads ..... 22. *E. jepsoni.*
            - Bracts little, if at all, longer than the heads.
              - Heads small (about 6 mm.) ..... 23. *E. minimum.*
              - Heads larger (9 to 10 mm.) ..... 24. *E. alismaefolium.*
        - Bractlets much longer than the flowers.
          - Bracts narrowly lanceolate and spreading, entire...... 25. *E. longistylum.*
          - Bracts very narrow and rigid, more or less spinose-bristly.
            - Bracts with conspicuous scarious margin at base.
              - Erect and tall; bracts 18 to 20 mm. long....... 26. *E. oblanceolatum.*
              - Prostrate; bracts about 10 mm. long ..... 27. *E. aristulatum.*

Bracts not at all scarious-margined.
  Bractlets spinose-toothed .... 28. *E. vaseyi.*
  Bractlets entire or nearly so .... 29. *E. parishii.*

1. **Eryngium yuccifolium** Michx. Fl. Bor. Am. 1: 164. 1803.

E. aquaticum L. Sp. Pl. ed. 2. 336. 1762 in part, not ed. 1 (*fide* Britten & Baker, Jour. Bot. **38**: 243. 1900).

From 3 to 18 dm. high, branching above; leaves broadly linear (from 4 to 25 mm. wide or more), tapering to a point, with remotely bristly margins, the lower ones sometimes becoming 6 to 9 dm. long; heads pedunculate, ovate-globose (18 mm. long), with ovate-lanceolate mostly entire cuspidate-tipped bracts shorter than the head, and similar bractlets; fruit scaly, about 2 mm. long, with short ovate calyx lobes, and long rigid styles.

Type locality, "in paludosis Virginiæ."

From Connecticut to Florida, west to Minnesota, Kansas, and Texas; also sparingly naturalized in Connecticut (near Bridgeport).

Specimens examined: We cite but few of the very numerous specimens of this common species.

VIRGINIA: Pittsylvania County, *Heller* 1104, July 20, 1893.
NORTH CAROLINA: Catawba County, *Small & Heller* 60, June 25–26, 1891.
GEORGIA: Lookout Mountain, *Ruth* 424, July, 1898.
ILLINOIS: Champaign County, *Rose & Clinton*, August 28, 1895.
IOWA: Fayette County, *Fink* 188, July 19, 1894.
KANSAS: Lawrence, *Stevens*, July.
ALABAMA: Auburn, Lee County, *Earle & Baker*, June 19, 1897; same station, *Pollard & Maxon* 78, July 10, 1900.
TEXAS: Industry, *Wurzlow*, in 1895.

2. **Eryngium synchaetum** (Gray) C. & R.

E. yuccaefolium synchaetum Gray in C. & R. Rev. N. Am. Umbell. 94. 1888.

Resembling *E. yuccifolium*, but smaller and usually more simple; leaves more bristly margined, and bristles in clusters of 2 to 4; heads more globose, 6 to 15 mm. in diameter.

Type locality, "Florida" in dry pine barrens near Jacksonville; collected by *Curtiss*, no. 996; type in Herb. Gray.

From Georgia and Florida to Arkansas and eastern Texas.

Specimens examined:

GEORGIA: Leesburg, *Earle*, June 20, 1895.
FLORIDA: Near Jacksonville, *Curtiss* 996*, July, 1875; St. Augustine, *M. C. Reynolds*, May 20, 1886; near Jacksonville, *Curtiss* 4336, 5034, July, 1893, 1894; near Eustis, Lake County, *Nash* 1216, 1487, July 9–31, 1894.
ALABAMA: Spring Hill, *Bush* 353, August 20, 1897.
MISSISSIPPI: Ocean Springs, *Tracy*, August 8, 1889; Biloxi, *Tracy*, June and July, 1891 and 1898; Ocean Springs, *Pollard* 1071, July 27, 1896.
ARKANSAS: Fort Smith, *Bigelow*, in 1853–54.
TEXAS: Eastern Texas, *Hildebrand*.

3. **Eryngium sparganophyllum** Hemsl. in Hook. Icon. IV. 6: pl. 2508. 1897. FIG. 5.

E. longifolium Gray, Pl. Wright. 2: 65. 1853, not Cav. Ann. 2: 133. 1793.

Stem tall, dichotomously branching; basal leaves (sometimes 9 to 12 dm. long) linear, tapering to a point, entire (rarely with 1 or 2 bristle teeth), strongly involute when dry; heads oval, 12 to 24 mm. long, with short ovate-lanceolate bracts and similar bractlets; fruit 4 mm. long, with large scales at the angles, and smaller ones between.

Type locality, "Las Playas Springs, near the Sierra de los Animos," New Mexico; collected by *Wright*, no. 1103, in 1851, and not since discovered; type in U. S. Nat. Herb.

Specimens examined:

NEW MEXICO: As cited under type locality.

4. **Eryngium baldwinii** Spreng. Syst. 1: 870. 1825.

Prostrate, often rooting at the joints, diffusely branched; lower leaves oblong, usually long-petioled, from entire to laciniately toothed; upper leaves much smaller, 3-parted (rarely entire or lobed), the divisions from lanceolate to filiform, toothed or entire; heads usually narrowly oblong at maturity (about 6 mm. long), with involucre of subulate bracts, and similar bractlets; flowers light blue; fruit 1 mm. long, with very prominent tubercles, ovate calyx-lobes shorter than the fruit, and styles 2 mm. long; oil tubes medium sized; seed face plane.

Type locality, "Carolina, Florida."

Sandy soil, from Georgia and Florida to Louisiana and Missouri; although all the material we have seen is from Florida.

Specimens examined:

FLORIDA: Apalachicola, *Chapman;* Biscayne Bay, *Palmer* 194, in 1874; St. Augustine, *Mary C. Reynolds*, in 1875; Lake Monroe, *Garber*, March, 1876; Indian River, *Curtiss* 1002, June, 1879; Mosquito Inlet, *Curtiss* 1002, May, 1882; *Vesterland*, in 1889; Vasey, in 1892; near Eustis, Lake County, *Nash* 545, April 15–30, 1894, and May 28 to June 15, 1895; near Jacksonville, *Curtiss* 5414, June 6, 1895.

Extremely variable in foliage.

5. **Eryngium prostratum** Nutt. DC. Prodr. 4: 92. 1830.

Prostrate, rooting at the joints, diffusely branched; lower leaves long-petioled, oblong, entire, few-toothed, or lobed at base; upper leaves smaller, clustered at the rooting joints, ovate, few-toothed or entire, with some additional trifid ones; heads narrowly oblong (about 6 mm. long), with involucre of reflexed lanceolate bracts longer than the heads, and very small bractlets; fruit with scattered tubercles 1 mm. long.

Type locality, "in Americae bor. territorio Arkansano;" collected by *Nuttall.*

Wet places from Georgia and Florida to eastern Texas, Indian Territory, Missouri, and Kentucky.

Specimens examined:

MISSISSIPPI: Meridian, *Tracy*, June 6, 1881.
TENNESSEE: Chester County, *Bain*, August, 1892.
MISSOURI: Texas County, *Tracy*, July 3, 1886.
TEXAS: Hempstead, *Hall* 242, June 2, 1872; *Thurow* 6, in 1889.
ARKANSAS: Fort Smith, *Bigelow*, in 1853–54; Little Rock, *Letterman*, in 1881; same station, *Coville* 20, July 8, 1887.
INDIAN TERRITORY: Sapula, *Bush* 193, September 21, 1894.

For discussion of *E. americanum* Walter and *E. integrifolium* Walter, see C. & R. Rev. N. Am. Umbell. 102, and Jour. Bot. **38**: 244. 1900.

6. **Eryngium phyteumae** Delar. Eryng. 51. pl. 21. 1808.

E. discolor Watson, Proc. Am. Acad. **18**: 193. 1883.

Stem erect, slender, 3 to 6 dm. high, bearing a single head (rarely more); basal leaves on very long petioles, oblong to narrowly oblanceolate, thin, slightly crenate; stem leaves few, sessile, linear-lanceolate, acutely or spinosely toothed; head ovate-oblong (about 12 mm. long), with involucre of numerous linear-lanceolate spinose-tipped bracts (white within and green without) longer than the heads and entire or sparingly spinose-toothed, and a conspicuous terminal tuft of exserted bractlets resembling the bracts; ordinary bractlets narrow, with a long spinose acumination; fruit with ovate abruptly cuspidate-tipped calyx lobes and long slender styles.

Type locality, "Nova Hispania," near Toluca, State of Mexico; collected by *Humboldt & Bonpland.*

From the mountains of southern Arizona southward into Mexico.

Specimens examined:

ARIZONA: In water, Cienega, Huachuca Mountains, *Lemmon* 2714, September, 1882.

7. **Eryngium floridanum** C. & R. Bot. Gaz. **13**: 142. 1888.

Erect, 6 to 9 dm. high; basal leaves narrowly oblong (2.5 to 10 cm. long), mostly entire, on long-jointed petioles (sometimes 3 dm. long); upper leaves becoming sessile, elongated-linear, usually remotely serrulate; bracts linear-lanceolate, rigid, sharp-pointed, entire or spiny-toothed, reflexed, longer than the subglobose heads; bractlets linear, rigid, entire, tapering to a pungent tip, much longer than the flowers; fruit with short ovate acute calyx-lobes and very long rigid styles.

Type locality, "brackish marshes [near Jacksonville], Florida;" collected by *Curtiss*; type in U. S. Nat. Herb.

Brackish marshes of Florida.

Specimens examined:

FLORIDA: East Florida, *Palmer* 192, in 1874; near Jacksonville, *Curtiss* 998*, 999; same station, *Curtiss*, in 1875; near Tampa, *Garber*, May, 1876; near Jacksonville, *Curtiss* 4337, August 14, 1893.

8. **Eryngium aquaticum** L. Sp. Pl. 1:232. 1753.

E. virginianum Lam. Encycl. **4**:759. 1796 (*fide* Britten & Baker, Jour. Bot. **38**: 243. 1900.)

E. praealtum Gray, Bost. Jour. Nat. Hist. **6**:210. 1850. (Pl. Lindh.)

Slender, 3 to 9 dm. high, branching above; basal and lower cauline leaves linear to oblong-lanceolate (petioles sometimes 3 dm. long), entire or with remote small hooked teeth; upper cauline leaves sessile, spiny-toothed or laciniate; heads ovate-oblong (12 mm. long), with lanceolate spiny-toothed or entire reflexed bracts mostly as long as the head or longer, and bractlets with 3 spiny cusps, the middle one largest; fruit scaly, with prominent lanceolate acuminate-cuspidate calyx-lobes equaling or exceeding the bractlets.

Type locality, "Virginia."

Wet places, New Jersey to Florida, and west to Texas.

Specimens examined:

NEW JERSEY: Toms River, *Hollick*, August 15, 1885; Salem County, *Holmes*, September 9, 1890.

DELAWARE: Ellendale, *Canby*, September 16, 1891.

MARYLAND: Curtis Creek, *Taylor*, September 16, 1891.

DISTRICT OF COLUMBIA: Eastern Branch, *Vasey*, in 1878.

VIRGINIA: Alexandria, *Vasey*, in 1874 and 1875; Cape Charles City, *Canby & Rose* 821, September 25, 1894.

NORTH CAROLINA: *McCarthy*, in 1884; near Wilmington, *Dewey*, in 1900.

SOUTH CAROLINA: Copper River swamp, *Ravenel* (type of *E. praealtum*); Bluffton, *Mellichamp* (representing *E. praealtum*).

We have been able to discover no difference between *E. virginianum* and *E. praealtum* Gray, the latter having been established upon unusually stout and broad-leaved forms from the swamps of South Carolina.

9. **Eryngium ravenelli** Gray, Bost. Jour. Nat. Hist. **6**: 209. 1850. (Pl. Lindh.)

Slender, from 4.5 to 9 dm. high, branching above; leaves linear, elongated, nearly terete (conduplicate), obscurely denticulate, the lower ones from 3 to 4.5 dm. long; heads as in *E. mettaueri*, with lanceolate spiny-toothed or entire reflexed bracts as long as the head, and bractlets with 3 strong and equal spiny cusps; fruit with short-mucronate calyx-lobes, and long rigid styles.

Type locality, "in flat and damp pine land, Black Oak, St. Johns, Berkeley district, South Carolina;" collected by *Ravenel*; type in Herb. Gray.

Wet pine barrens, South Carolina and Florida.

Specimens examined:

SOUTH CAROLINA: Near Aiken, *Ravenel*, in 1849 and 1869.

FLORIDA: *Chapman* (described as *E. virginianum*); St. Marks, Wakulla County, *Nash* 2537, September 3, 1895.

10. **Eryngium mettaueri** Wood, Class-book, ed. 2, 379. 1860.

Stem erect, simple, 12 to 18 dm. high, branching at top; stem leaves linear to linear-lanceolate, entire or sparingly spinose-toothed at base, the lower linear (sometimes 3 to 6 dm. long), on very long jointed petioles; heads ovate-oblong (12 mm. long), with numerous reflexed linear-lanceolate spinose-tipped and toothed bracts (whitish within and greenish without) larger than the heads, and lanceolate bractlets with 3 strong and equal spiny cusps (as in *E. ravenellii*); fruit about 2 mm. long, with ovate acute calyx-teeth, and long stout rigid styles.

Type locality, "in wet places, Newport, Florida;" collected by *Mettauer*. Found but once in the type locality.

We have not reexamined this species since our former revision.

11. **Eryngium integrifolium** Walter, Fl. Car. 112. 1788.

E. virgatum Lam. Encycl. **4**: 757. 1796.
E. americanum Sprengel in Roem. & Schult. Syst. **6**: 337. 1820.

Erect, 3 to 9 dm. high, branching above; leaves oblong or oblong-ovate, often subcordate, on short petioles; basal ones entire or crenately toothed; upper ones becoming sharply serrate or even laciniately toothed; bracts linear and entire or with 2 to 4 prickly teeth, longer than the subglobose heads; bractlets equally 3-cuspidate, little longer than the flowers; fruit with lanceolate acuminate calyx-lobes and long rigid styles.

Type locality not given, but presumably in the Carolinas; type in Herb. British Museum.

Damp pine barrens, from North Carolina to Florida, and westward to Louisiana and Texas.

Specimens examined:

NORTH CAROLINA: Statesville, *Hyams*, July, 1879; Great Smoky Mountains, Swain County, altitude 570 meters, *Beardslee & Kofoid*, August 28, 1891; near Biltmore, *Biltmore Herb.* 2357*b*, August 12, 1897.

FLORIDA: Apalachicola, *Chapman;* Walton County, *Curtiss* 1000, September; Wakulla County and Gadsden County, *Nash* 2539, 2573, September 3–5, 1895; near McClenny, *Curtiss* 6008, September 23, 1897.

ALABAMA: Near Mobile, *Harvey;* same station, *Mohr*, July, 1879; Spring Hill, *Bush* 351, August 25, 1897.

MISSISSIPPI: Ocean Springs, *Tracy*, August 8, 1889; Scranton, Jackson County, *Pollard* 1203, August 5–6, 1896; Biloxi, *Tracy* 4479, August 23, 1898.

TEXAS: Near Texarkana, Bowie County, *A. A. & E. Gertrude Heller* 4089, August 12, 1898.

In our Revision of 1888 (p. 102), under *E. prostratum* we discussed the standing of *E. americanum*, referred to Walter by Sprengel, and of *E. integrifolium* Walter. As then stated, there is no *E. americanum* Walter, Sprengel having copied under that name the description of *E. integrifolium* Walter. It has now been discovered by Mr. James Britten and Mr. E. G. Baker, of the British Museum, who have examined the type of *E. integrifolium* Walter, that it is identical with *E. virgatum* Lam.

Eryngium integrifolium ludovicianum (Morong) C. & R.

E. ludovicianum Morong, Bull. Torr. Bot. Club **14**: 51. 1887.
E. virgatum ludovicianum Morong in C. & R. Rev. N. Am. Umbell. **96**. 1888.

Leaves linear-lanceolate, or sometimes linear.

Type locality, sandy barrens of "Natchitoches County, La.;" collected by *A. B. Langlois;* type in Herb. Columbia Univ.

Barrens of Georgia, to Louisiana and Texas.

Specimens examined:

GEORGIA: Irby, *Tracy* 1492, July 28, 1890; Poulan, Worth County, *Pollard & Maxon* 547, August 14, 1900.

12. **Eryngium hookeri** Walp. Repert. **2**: 389. 1843.

E. coronatum Torr. & Gray, Fl. **1**: 604. 1840, not Hook. & Arn.

Stem erect, branching above, 3 to 6 dm. high; basal leaves petioled, somewhat dentate; lower stem leaves almost sessile, lanceolate, laciniately toothed and spinulose, with a pair of small laciniate segments at base; upper leaves palmately 5 to 7-parted, with narrow pinnatifid-laciniate spinose-tipped segments; heads ovate-oblong (8 to 12 mm. long); involucre of numerous narrowly lanceolate spinny-toothed bracts longer than the head; bractlets lanceolate, entire, spiny at tip, 1 or 2 of the terminal ones often elongated and conspicuously exceeding the head; fruit scaly, 1 mm. long, with ovate spiny-tipped calyx-lobes, and short styles.

Type locality, "Texas;" collected by *Drummond.*

Low grounds, Texas.

Specimens examined:

TEXAS: Matagorda County, *Bechdolt;* swampy prairies near Dallas, *Reverchon* 357, July, 1879 and 1880; Harris and Navarro counties, *Joor;* prairies, *Pammel*, July, 1888.

13. **Eryngium aromaticum** Baldwin in Elliott's Sketch **1**: 344. 1821.

Stems decumbent or erect, several from one root, simple to near the summit, very leafy, 3 to 6 dm. high; leaves pinnately parted, with entire segments and cartilaginous margins; the 3 upper segments remote and broader, cuspidate; the lower ones scattered and setaceous; heads globose, 6 to 10 mm. long, with 3-cleft bracts longer than the head, and 3-toothed bractlets; fruit tuberculate, 1 mm. long, with setaceous calyx teeth 2 mm. long, and long styles; oil tubes large; seed flattened dorsally, with plane face.

Type locality, "dry pine barrens, Florida."

Pine barrens of Florida and Alabama.

Specimens examined:

FLORIDA: Caloosahatchee, *Chapman;* near Jacksonville, *Curtiss* 1001; St. Augustine, *Mary Reynolds*, September, 1875; Tocoi, *Garber*, July, 1876; Manatee, *Garber*, September, 1877; East Florida, *Palmer* 191, in 1874; Manatee, *Simpson*, in 1889; near Jacksonville, *Curtiss* 4335, 5215, September, 1893 and 1894; Lake City, *Nash* 2491, August 29–31, 1895.

14. **Eryngium diffusum** Torr. Ann. Lyc. N. Y. **2**: 206. 1828.

Usually low and diffusely branching from the base, varying from 2 to 40 cm. in height; leaves sessile, palmately parted, coriaceous, midrib very prominent beneath and margins cartilaginous; segments oblong, incisely serrate and spinose; heads subglobose, about 12 mm. long, on very short peduncles or sessile; involucre of bracts resembling the leaves, longer than the head; bractlets lanceolate, entire, spinosely tipped; fruit clothed with imbricated pointed scales, less than 2 mm. long, with ovate long-pointed calyx lobes twice as long, and long styles; oil tubes very large, more or less sunken in the somewhat dorsally flattened seed; seed face plane.

Type locality, "on the Canadian," Arkansas; collected by *James* in 1820; type in Herb. Columbia Univ.

ILLUST.: Marcy's Report, pl. 6.

Sandy plains, Arkansas, Oklahoma, Indian Territory, and Texas.

Specimens examined:

OKLAHOMA: Cheyenne County, *Carleton* 454, August, 1891.

INDIAN TERRITORY: Near Cash Creek, *Sheldon* 169, July 17, 1891.

TEXAS: Nueces River, *Berlandier* 2508, June, 1834; Baylor County, *Reverchon* 356, September, 1879; Colorado River, *Havard*, August, 1881; Baird, *Letterman* 51, August, 1882; *Nealley*, in 1888; Gillespie County, *Jermy* 643, 644.

15. **Eryngium wrightii** Gray, Pl. Wright. **1**: 78. 1852.

Glaucous; stem erect, branching, 3 to 6 dm. high; leaves rigid; basal and lower stem leaves oblanceolate, pectinate-dentate or pinnatifid with triangular teeth tipped with long bristles; stem leaves sessile, from laciniately toothed to pinnately cut into linear-lanceolate cuspidate segments; heads ovate to oblong, about 12 mm. long; involucre of numerous linear-lanceolate entire to remotely toothed spiny-tipped bracts, whitish within, green without, twice as long as the head; bractlets subulate, rigid, spiny-tipped, longer than the flowers, the terminal one or two very prominent and crowning the head; fruit 1 mm. long, with short ovate mucronate calyx lobes, and long styles.

Type locality, "bed of the Limpia or Wild Rose Creek," Texas; collected by *Wright*, no. 230, in 1849; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Hills and plains, Texas to Arizona, and extending into Mexico.

Specimens examined:

TEXAS: *Wright* 230, August, 1849; *Mex. Bound. Surv.* 412; near Dallas, *Hall* 243, June 30, 1872; western Texas, *Havard*, July, 1883; Chenates region, *Nealley* 169, in 1889.

ARIZONA: Sonoita Valley, altitude 1,950 meters, *Rothrock* 603, August, 1874; Apache Pass, Chirricahua Mountains, *Lemmon*, August, 1881; northern Arizona, *Lemmon* 18, in 1882; near Fort Huachuca, *Wilcox* 365, August, 1894.

16. **Eryngium lemmoni** C. & R. Bot. Gaz. **14**: 279. 1889.

Glaucous; stem erect, branching above, 3 to 9 dm. high; basal and lower stem leaves rigid, elongated oblanceolate, sharply dentate; uppermost leaves broadly ovate, more or less deeply cut, the lobes cuspidate-tipped; heads short-oblong (8 to 12 mm. long), much surpassed and enveloped by the conspicuous involucre of broadly cuneate leaf-like cuspidate-toothed and lobed bracts (becoming 8 to 10 mm. broad);

bractlets scarcely exceeding the flowers and rather weak, the terminal ones not all prominent; fruit with short ovate cuspidate-tipped sepals, and long slender styles.

Type locality, "Chirricahua Mountains, southeastern Arizona;" collected by *Lemmon*, no. 17, in 1881; type in U. S. Nat. Herb.

Mountains of southeastern Arizona and extending into Mexico.

Specimens examined:

Arizona: Type specimens as cited under type locality.

17. **Eryngium leavenworthii** Torr. & Gray, Fl. **1**: 604. 1840.

Stout, 3 to 9 dm. high, branching above, the upper leaves and heads often purplish; lowest stem leaves broadly oblanceolate, spinosely-toothed, gradually becoming more or less palmately parted above to the ordinary stem leaves, which are sessile and deeply palmately parted into narrow incisely pinnatifid spreading pungent segments; heads pedunculate, ovate-oblong, 2.5 to 3.5 cm. long; involucre of incisely pinnatifid spinose bracts about as long as the head; bractlets narrow, 3 to 7-cuspidate, the terminal ones very prominent, resembling the bracts and crowning the head; fruit 2 mm. long, with oblong pinnatifid 3 to 5 cuspidate sepals more than twice as long as the fruit, and short rigid styles; oil tubes large; seed flattened laterally.

Type locality, "Red River, Arkansas;" collected by *Leavenworth;* type in Herb. Gray.

Dry soil, Kansas, Arkansas, Oklahoma, Indian Territory, and Texas.

Specimens examined:

Kansas: Junction City, *M. H. Panton;* Bourbon County, *Hall,* in 1869.

Indian Territory: *Palmer* 146, in 1868.

Oklahoma: Pawnee, *Blankinship,* August 30, 1895.

Texas: *Wright,* in 1849 and 1852; *Mex. Bound. Surv.* 411; Fort Worth, *L. F. Ward,* September 9, 1877; same station, *Havard;* Concho, *Havard,* July, 1881; Gillespie County, *Jermy* 717; Sherman, *Mrs. M. L. Nash,* in 1888 and 1893; Ballinger, *Nealley* 379, August 1889.

18. **Eryngium armatum** (Watson) C. & R. Bot. Gaz. **13**: 141. 1888.

E. petiolatum armatum Watson, Bot. Calif. **1**: 255. 1876.

Diffuse, branching throughout, 1.5 to 3 dm. high, or even 5 to 6 dm.; basal leaves oblanceolate (sometimes broadly so), from serrate to spinose-dentate, attenuate into a short more or less margined petiole; stem-leaves narrower and sessile; heads sessile or short-peduncled, globose (about 12 mm. in diameter), with involucre of triangular-lanceolate (broader at base) entire rigid callous-margined spreading bracts (10 to 15 mm. long) much longer than the head; bractlets the same and fully as prominent; fruit with ovate-lanceolate acuminate calyx lobes longer than the short styles.

Type locality not given.

Central California, apparently in low ground.

Specimens examined:

CALIFORNIA: Moist places, near Mendocino, Mendocino County, *Pringle*, August 5, 1882; Chico, Butte County, *Mrs. R. M. Austin*, in 1883; Antioch, Contra Costa County, *M. K. Curran*, May, 1884; Adeline Station, *Bioletti*, in 1891; Crystal Springs, San Mateo County, *Alice Eastwood*, May, 1896.

19. **Eryngium articulatum** Hook. Lond. Jour. Bot. **6**: 232. 1847.

E. harknessii Curran, Bull. Calif. Acad. Sci. **1**: 153. 1885.

Erect, 3 to 7 dm. high, dichotomously branching above, usually with a pedunculate head in the forks; basal and lower stem leaves reduced to very long (7.5 to 25 cm.) nodose petioles, with or without a small lanceolate nearly parallel-veined blade (from entire to spinulose-serrate); upper stem leaves sessile and opposite, sometimes more or less laciniate at base; heads globose to short oblong, more or less purplish or blue; bracts lanceolate, cuspidate tipped, spiny-toothed below, 12 to 18 mm. long, as long as the heads or longer; bractlets tricuspidate (sometimes with a pair of small accessory teeth below), the middle one much the largest, longer than the sepals; fruit with lanceolate cuspidate-acuminate calyx lobes 4 to 5 mm. long.

Type locality, "stony edges of the Spokane River, and Skitsoë and Cœur d'Alene lakes," Idaho; collected by *Geyer*, no. 583, August and September, 1843–44; type in Herb. Brit. Mus., duplicate in Herb. Gray.

From northern Idaho, through Washington and Oregon, to central California.

Specimens examined:

IDAHO: Shores of Lake Cœur d'Alene, altitude 640 meters, *Leiberg* 543, August 15, 1895; moist ground near Moscow, *Henderson*, in 1894.

WASHINGTON: Olympia, *Henderson* 2518, 2519; near Pullman, Whitman County, *Piper* 1559, August 12, 1893.

OREGON: Rogue River Valley, *Wilkes' Exped.* 1187; same station, *Howell*, July 15, 1887; Woodville, Jackson County, *Howell* 734, August 18, 1888; Aspen Lake, near Klamath Lake, *Applegate* 464, July 23, 1895.

CALIFORNIA: Suisun Marsh, Solano County, *Harkness*, July, 1885; near Mount Shasta, *Miller*, July, 1886; Suisun Marsh, *Greene*, September 29, 1889; Goose Lake Valley, *Mrs. R. M. Austin*, August, 1895.

The discovery of *E. articulatum* in its type locality has enabled us to clear up the confusion that has arisen in reference to this species, which has become a perplexing aggregate. Leiberg's specimens seem to be exact duplicates of those of Geyer. It is evident that the numerous later collections that have been named *E. articulatum* have been wrongly referred, and must be looked for elsewhere. In connection with the original description Hooker publishes a field note of Geyer, which describes the habit of the plant so well that we quote it as follows:

"In April the young plants are wholly submerged, and present the appearance of some articulated *Juncus*, the leaves, or rather the petioles, being similarly terete and jointed. On emerging above the water these petioles expand into laminæ at the top, retaining the jointed swollen character in the costa. The radical petioles are 8 to 10 inches long. Those of the stem, in proportion as they are out of the water, become flattened and the margin spinuloso-ciliate."

20. **Eryngium petiolatum** Hook. Fl. Bor. Am. **1**: 259. 1834.

E. petiolatum juncifolium Gray, Proc. Am. Acad. **8**: 385. 1872.

Erect and slender, 3 to 4 dm. high, branching above; basal and lower stem leaves reduced to long nodose petioles, with or without small narrowly lanceolate blades, which are nearly parallel veined and from remotely spinulose to spinulose-serrate; upper stem leaves narrow, opposite, attenuate below, spinulose-serrate above, spinulose at base; heads short-peduncled, globose, small (about 8 mm. in diameter); bracts and bractlets subulate, ciliate-spinose, rigid, at least twice as long as the head, and making it quite spinose; fruit with lanceolate cuspidate-acuminate sepals longer than the styles.

Type locality, "Moist soils on the plains of the Multnomak [probably Multnomah] River," Oregon; collected by *Douglas;* type in Herb. Brit. Mus.

Wet ground, western Oregon.

Specimens examined:

OREGON: "Near the Umpqua River," *Wilkes Exped.* 1156; wet places in prairies, near Salem, Marion County, *Hall* 200, in 1871 (type of *E. petiolatum juncifolium* Gray); "swales, western Oregon," *Howell*, August, 1880; Hood River, Wasco County, *Henderson* 369, August 5, 1884; Willamette Valley, *Howell* 30, August, 1886; near Medford, *Howell,* July, 1887; near Kerbyville, *Howell* 30A, July, 1887.

Hooker described this species from "one, and that an imperfect specimen," but at the same time it is an unmistakable diagnosis. Later authors confused it with *E. articulatum*, and Gray merged the two under the name *E. petiolatum*. From that time the specimens of *E. articulatum* stood for *E. petiolatum*, and when specimens of true *E. petiolatum* came to hand in the collections of Hall, and from near the type locality, Gray described them as *E. petiolatum juncifolium*. This is, of course, not the *E. petiolatum* of our former revision.

21. **Eryngium elongatum** C. & R., sp. nov.

Erect, 3 to 4 dm. high, somewhat branching above; basal leaves elongated, oblanceolate, 3 dm. long, spinulose-serrate, abruptly acuminate, gradually tapering below into spinulose-winged petioles; upper leaves similar, but much smaller; heads on short stout peduncles, nearly globose, about 15 mm. long; bracts broadly linear, somewhat weak and becoming reflexed, much longer than the heads, becoming 25 mm. long, spinose-bristly except toward the tip, more or less scarious margined at base; bractlets narrow and rigid, a little longer than the flowers, with conspicuous scarious margin below (broader at base), usually without bristles; sepals ovate, scarious-margined, 2 mm. long, with an abruptly cuspidate-bristly tip; styles longer than the sepals.

Type locality, near San Francisco, Cal.; collected by *G. R. Vasey*, in 1875; type in U. S. Nat. Herb.

In the Bay region of California.

Specimens examined:

CALIFORNIA: The type as cited.

A somewhat immature specimen collected by *Jepson*, May 23, 1897, at "Wells Hill, Upper Vaca Valley, Napa River Basin," may belong here, but it has narrower and less spinulose leaves and smaller heads and bracts.

22. **Eryngium jepsoni** C. & R., sp. nov.

Erect, 3 to 6 dm. high, from almost simple to much branching; basal leaves narrowly oblanceolate, tapering into long petioles, spinose-toothed and sometimes with a few narrow segments; upper leaves opposite, short-petioled or sessile; heads on very short peduncles, nearly globose, about 6 mm. long; bracts very narrow and rigid, much longer than the heads, 8 to 20 mm. long, the lowest third with spinose bristles, hardly scarious-margined at base; bractlets narrowly linear-lanceolate, a little longer than the flowers, with conspicuous scarious margin below (broadening upward to an acuminate tip or lobe on each side), at the top of which and just above are a few bristles; sepals oblong, scarious-margined, 2 mm. long, with an abruptly cuspidate-bristly tip about one-third as long; styles longer than the sepals.

Type locality, near Orinda Park, Contra Costa County, Cal.; collected by *W. L. Jepson* in 1895; type in U. S. Nat. Herb.

In the Bay Region of California, Contra Costa County.

Specimens examined:

CALIFORNIA: *Wright*, in 1853–56; Contra Costa County, *G. R. Vasey* 223, July, 1880; near Orinda Park, Contra Costa County, *Jepson*, September 1, 1895.

23. **Eryngium minimum** C. & R.

E. petiolatum minimum C. & R. Rev. N. Am. Umbell. 98. 1888.
E. articulatum microcephalum C. & R. l. c. 99.

Low, 1 to 3 dm. high or even less, leaves and the few nearly simple stems clustered at base; basal leaves narrow, with more or less elongated petioles, from simple and spinosely-toothed to pinnately-segmented; the segments from toothed to lacerate or pinnately-parted, more or less distant below and represented on the petiole by spinous processes; heads on very short peduncles, nearly globose, about 6 mm. long; bracts linear-lanceolate, as long as the heads or a little longer, 6 to 10 mm. long, the lower two-thirds with spinose bristles, hardly scarious-margined at base; bractlets linear, a little longer than the flowers, with conspicuous scarious margin below (broadening downward), at the top of which and just above are a few bristles; sepals ovate, scarious-margined, 1 mm. long, with an abruptly cuspidate-bristly tip about as long; styles longer than the sepals.

Type locality, "Donner Lake," California; collected by *C. F. Sonne*.

In the Sierra Nevada of northeastern California.

Specimens examined:

CALIFORNIA: "Sierra Nevada Mountains," *Lemmon*, in 1875; Plumas County, *Mrs. R. M. Austin*, in 1878 (type of *E. articulatum microcephalum* C. & R.); dry meadow at Donner Lake, Nevada County, *Sonne*, August 1892.

We have not been able to reexamine the type of *E. minimum*, and therefore can not refer *E. articulatum microcephalum* to it with certainty. An examination of specimens from the type locality of *E. minimum*, however, together with a reexamination of the type of *E. articulatum microcephalum*, seem to justify this tentative reference, although the sepals of the latter are somewhat different, and the heads have a decidedly bluish tint.

24. **Eryngium alismaefolium** Greene, Erythea **3**: 64. 1895.

The numerous leaves and stems clustered at base and arising from a fascicle of coarse roots; stems diffusely branching, at first much shorter than the leaves, later often exceeding them; basal leaves elongated, sometimes 3 dm. long, the long more or less nodose petioles (nodose ones terete and not spinose, the others flat and spinose) with or without spinosely serrate or somewhat laciniate oblanceolate blades; upper leaves similar, but much smaller; heads usually on short peduncles, nearly globose, 9 to 10 mm. high; bracts subulate-lanceolate, usually somewhat longer than the heads, 10 to 12 mm. long, with or without a few spinose bristles, somewhat scarious-margined at base; bractlets subulate-lanceolate, a little exceeding the flowers, with conspicuous scarious margin below (broadening downward), with or without a few bristles; sepals ovate-oblong, scarious-margined, 1 mm. long, tapering into a cuspidate-bristly tip; styles longer than the sepals.

Type locality, "Egg Lake, Modoc County, Cal.;" collected by *Baker & Nutting*, August 25, 1894; type in Herb. Univ. Calif.?

Northeastern California and eastern Oregon.

Specimens examined:

California: Mountain meadows, Lassen County, *Mrs. R. M. Austin*, August, 1880; Lassen Buttes, Plumas County, altitude 1,800 meters, *Brown* 612, August 1–15, 1897.

Oregon: Near Silver Lake, Lake County, altitude 1,590 meters, *Leiberg* 753, August 19, 1894; near Button Springs, Lake County, altitude 1,470 meters, *Leiberg* 790, August 23, 1894; Grand Ronde Valley, *Cusick* 2117, September 3, 1898.

25. **Eryngium longistylum** C. & R., sp. nov.

Low, 1 to 2 dm. high, from a fascicle of thick roots, branching throughout and spreading; basal leaves narrow, pinnately cut into distant almost spine-like segments; heads nearly sessile, globose, about 4 mm. long; bracts narrowly lanceolate, spreading as in *E. armatum*, much longer than the heads, 6 to 8 mm. long, mostly entire, slightly scarious-margined at base; bractlets similar, but somewhat puberulent, narrower, and with broader scarious margins at base; sepals lanceolate, scarious-margined, 1 mm. long, tapering above into a weak acuminate tip; styles very much longer than the sepals.

Type locality, San Simeon, San Luis Obispo County, Cal.; collected by *M. K. Curran*, June, 1888; type in Herb. Coulter.

The type is the only specimen seen.

26. **Eryngium oblanceolatum** C. & R., sp. nov.

Erect and tall, 3 to 6 dm. high, dichotomously branching; basal leaves oblanceolate, tapering into long petioles, from spinosely serrate to cleft, the teeth or small segments continuing down the petiole; heads on very short peduncles, nearly globose, about 6 mm. long; bracts very narrow and rigid, much longer than the heads, 18 to 20 mm. long, the lowest third with spinose bristles, conspicuously scarious-margined at base; bractlets very narrow and rigid, much longer than the flowers, about the size of the bracts, with conspicuous scarious margin below (broadening upward to a lobe on each side), at the top of which and sometimes above are a few bristles; sepals ovate, scarious-margined, 1.5 mm. long, tapering above into a short apiculation; styles longer than the sepals.

Type locality, Sonoma Valley, California; collected by *Dr. J. Torrey*, no. 159, in 1865; type in U. S. Nat. Herb.

In the valleys of the bay region of California.

Specimens examined:

CALIFORNIA: Sonoma Valley, Sonoma County, *Torrey* 159, in 1865; Napa Valley, Napa County, *Jepson*, June 2, 1896; Madrone, Santa Clara County, *Jepson*, June, 1896.

27. **Eryngium aristulatum** Jepson, Erythea 1: 62. 1893.

Prostrate, very slender, the stems 2.5 to 4 dm. in length; basal leaves tapering into a long petiole, 1 dm. long (including the petiole), the short blade spinose-toothed and with a few lanceolate segments; stem leaves opposite, sessile, spinulose-serrate; heads very numerous, 6 mm. long; bracts exceeding the head, about 10 mm. long, densely spinescent at base; bractlets spinose, the body narrowly lanceolate, inversely sagittate-winged from the base upward, the lobes of the wings thus forming sinuses, in each of which are borne 1 to 3 awns surpassing the breadth of the wing; calyx-lobes ovate-lanceolate, hyaline-margined, 2 mm. long, tapering into a cuspidate-bristly tip exceeded by the long styles.

Type locality, "in the dry bed of a winter lake situated in the mountains south of Uncle Sam Mountain, Lake County, California;" collected by *W. L. Jepson*, July 28, 1892; type in Herb. Univ. Calif.

Mountains of northeastern California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

28. **Eryngium vaseyi** C. & R. Bot. Gaz. **13**: 142. 1888.

Stems 2.5 to 4 dm. high, several from a common root and diffusely branching; leaves oblanceolate, unequally spinulose-serrate, attenuate below; bracts and bractlets similar, narrow, thick and rigid, spinose and spiny-toothed, divergent, 12 to 15 mm. long, forming a spinose burr-like head; fruit with ovate-oblanceolate cuspidate-acuminate calyx-lobes shorter than the styles.

Type locality, "in wet ground, San Antonio River (Monterey County), California;" collected by *G. R. Vasey*, no. 222, July 1880; type in Herb. Canby (now in College of Pharmacy, New York City).

Apparently at low levels, central California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality, *Lemmon;* Chico, Butte County, *Mrs. R. M. Austin*, in 1883; Wilson Creek, near Vacaville, Sonoma County, *Jepson*, September 30, 1893; near Elmira, Solano County, *Jepson*, June 13, 1893; near Escalon and Burnet, lower San Joaquin, Santa Clara County, *Jepson*, July, 1896.

29. **Eryngium parishii** C. & R., sp. nov.

Low, much branched at base, the slender stems erect or spreading, 1 to 4 dm. long; basal leaves from simple to pinnate, the blades or segments from laciniate-toothed to cleft, tapering into a long more or less spinosely-toothed petiole; inflorescence beginning near the base and diffusely branching, the heads on very short peduncles, nearly globose, about 6 mm. long; bracts very narrow and rigid, longer than the heads, 12 to 18 mm. long, with a few spinose bristles at base and not at all scarious-margined; bractlets very narrow and rigid, much longer than the flowers, about the size of the bracts, with short scarious margin below (broadening upward to a short lobe on each side), at the top of which and just above there may or may not be a few bristles, the margined base inclosing the fruit and falling off with it; sepals ovate, scarious-margined, 1.5 mm. long, tapering above into a cuspidate-bristly tip; styles longer than the sepals.

Type locality, Oceanside, San Diego County, Cal.; collected by *S. B. Parish*, no. 4436, in 1897; type in U. S. Nat. Herb.

Sandy ground, southern California and extending into Lower California.

Specimens examined:

CALIFORNIA: Mesas near San Diego, *Orcutt*, June, 1882 and 1889; San Luis Obispo County, *Lemmon* 61, June, 1887; Oceanside, San Diego County, altitude 0 to 15 meters, *Parish* 4436, June 11-16, 1897.

The following forms are doubtful because of immaturity or insufficiency of material, and we do not venture to characterize them fully or to name them, but they seem sufficiently distinct to mention, and may prove to be new species. They all belong to the group with long styles, and bractlets conspicuously scarious-winged below.

A specimen collected by *M. E. Jones*, no. 3602, near Auburn, Placer County, Cal., July 8, 1882, has conspicuously spinose-bristly bracts and bractlets much exceeding the head, but the flowers are in bud and basal leaves are lacking. The station of the specimen is also quite distinct from that of the species it most resembles.

A specimen collected by *George Hansen*, no. 391, near Pinegrove, Amador County, Cal., at an altitude of 560 meters, June 17, 1893, is a low plant, with basal leaves pinnately cut into distant almost spine-like segments.

A specimen collected by *Brandegee*, June 3, 1889, at Alpine Station, San Diego County, Cal., differs from the coast forms with which it is allied, not only in its very different elevation, but also in its much more prominent bracts. It may belong to some of the coast species, but as we have seen only the heads, which seem to suggest a difference, we do not venture at present to assign it to any of them.

A specimen in Professor Greene's herbarium, collected by *Michener & Bioletti* at "San Joaquin Bridge," San Joaquin County, September, 1892, is unlike any species we have seen, but is too immature to characterize definitely. It is very slender and spreading, from a fascicle of thick roots; basal leaves reduced to nodose petioles 3 dm. long or more; lower stem leaves similar, but shorter, and with very small lanceolate entire or somewhat spinosely-toothed blades; uppermost leaves sessile and bristly-toothed and cleft; heads very small and scattered along the loose and elongated branching stem; bracts very narrow, much longer than the heads, sparsely bristly at base; bractlets scarious below; sepals ovate-lanceolate, scarious-margined, tapering into a cuspidate tip.

6. **CHAEROPHYLLUM** L. Sp. Pl. 1:258. 1753.

Calyx teeth obsolete. Fruit flattened laterally, narrowly oblong to linear, rounded at base, with short beak or none. Carpel terete, with equal ribs, each with a large group of strengthening cells usually occupying the whole thickness of the thick pericarp. Stylopodium conical; styles very short. Oil tubes small, mostly solitary in the intervals, 2 on the commissural side. Seed face more or less deeply sulcate.

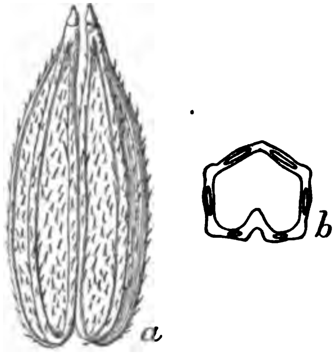


FIG. 6.—Chaerophyllum tainturieri dasycarpum: *a*, × 9; *b*, × 12.

Annuals, in moist ground, with ternately decompound leaves, pinnatifid leaflets with oblong obtuse lobes, usually no involucre, involucels of many bractlets, and white flowers.

First species cited, *C. sylvestre* L.

A group of about 40 species, extending from Europe to central Asia, probably three species occurring in the United States east of the Rocky Mountains.

In our former revision of the genus we were unable to separate *C. tainturieri* as a species from *C. procumbens*. Further study and more abundant material, however, have convinced us that they are probably to be separated by the characters of the fruiting umbel and of the fruit, as well as by the range. In all the forms mature fruit is very essential for determination.

Glabrous; fruit not beaked.
  Fruiting umbels of 2 to 4 fruits on weak spreading pedicels..... 1. *C. procumbens.*
  Fruiting umbels of 10 to 17 fruits, which are sessile or on stout pedicels, forming a compact cluster.. 2. *C. texanum.*
Pubescent; fruit beaked; fruiting umbels compact................. 3. *C. tainturieri.*

1. **Chaerophyllum procumbens** (L.) Crantz, Umbel. 77. 1767.

Scandix procumbens L. Sp. Pl. 1:257. 1753.

Glabrous or nearly so; stems slender, spreading, 1.5 to 4.5 dm. high;

umbels sessile or peduncled, few-rayed; rays 1 to 5 cm. long; fruiting umbel open, of 2 to 4 fruits on weak and usually spreading pedicels 4 to 9 mm. long; fruit narrowly oblong, about 8 mm. long, glabrous, narrowed but not beaked at apex; ribs filiform, much narrower than the broad intervals; styles very short; seed face deeply sulcate.

Type locality, "Virginia;" collected by *Gronovius*, no. 147.

From New York to Virginia, west to Michigan, Iowa, and Tennessee.

Specimens examined:

New York: Ithaca, *Kellerman*, May 28, 1874; same station, *Pearce*, May 26, 1884; same station, *Coville*, May 27, 1885.
Pennsylvania: York County, *Small*, May 2, 1891.
Delaware: *Canby*, May, 1874.
District of Columbia: Rock Creek, *Ward;* Eastern Branch of Potomac, *Blanchard*, April 28, 1892.
Tennessee: Knox County, *Scribner*, April 13, 1889.
Ohio: Niles, *Ingraham*, May, 1891; Lorain County, *Ricksecker*, May 4, 1895.
Michigan: Near Agricultural College, *Wheeler*, May 19, 1896.
Illinois: Near Chicago, *Babcock*, May 13, 1874.

Two specimens, one collected by *Rowlee* near Ithaca, N. Y., May 19, 1888, the other by *Umbach* near Chicago, May 21, 1898, differ from the ordinary forms in the more prominent ribs, but the plants are distinctly of the *procumbens* type. The immature fruit and scanty material forbid any more definite reference.

Chaerophyllum procumbens shortii Torr. & Gr. Fl. 1: 637. 1840.

Fruit more broadly oblong to ovate, about 6 mm. long, obtuse rather than narrowed at apex.

Type locality, "Kentucky;" collected by *Dr. Short*.

From Pennsylvania to Virginia and west to Kentucky.

Specimens examined:

Maryland: Glen Echo, *Pollard* 294, May 31, 1895.
Virginia: Alexandria, *Rose*, May 24, 1890.

2. **Chaerophyllum texanum** C. & R., sp. nov.

Resembling *C. tainturieri*, but glabrous; fruiting umbels more dense, of 10 to 17 fruits; fruit smaller and not beaked, 4 to 5 mm. long, glabrous; ribs very prominent, almost obliterating the intervals.

Type locality, near Houston, Tex.; collected by *J. N. Rose*, no. 4173, May 6, 1899; type in U. S. Nat. Herb.

Eastern Texas.

Specimens examined:

Texas: *Hall; Reverchon;* Guadalupe Mountains, *Havard*, October 5, 1881; *Nealley*, in 1888; near Houston, *Rose* 4173, May 6, 1899.

3. **Chaerophyllum tainturieri** Hook. Comp. Bot. Mag. 1: 47. 1835.

C. procumbens tainturieri C. & R. Bot. Gaz. **12**: 160. 1887.

Resembling *C. procumbens*, but pubescent and stouter; fruiting umbel more compact, of 7 or 8 fruits either sessile or on short stout erect or somewhat spreading pedicels sometimes reaching 6 mm. in length; fruit linear-oblong, distinctly beaked, 6 to 7 mm. long, glabrous; ribs very prominent, broader than the intervals but not obliterating them; styles longer; seed face less deeply sulcate.

Type locality, "N. Orl." [New Orleans]; collected by *M. Tainturier.*

From Alabama and adjacent Tennessee to Texas.

Specimens examined:

TENNESSEE: Palmetto, *Montgomery*, May 8, 1894.

ALABAMA: Mobile, *Mohr*, April, 1879; Tuscaloosa, *L. F. Ward*, April 7, 1892.

MISSISSIPPI: Starkville, *Phares*, May, 1883; Jackson, *Phares*, April, 1886; Starkville, *Tracy* 1350, April 9, 1892.

TEXAS: Hempstead County, *Hall* 261, June 8, 1872; Industry, *Wurzlow*, May, 1895.

Specimens from near Suffolk, Nansemond County, Va., collected by *Britton & Small*, May 27, 1893, seem to resemble *C. tainturieri* in every particular except that they are glabrous. This fact, together with the distinct range, makes us hesitate to refer them here.

Chaerophyllum tainturieri dasycarpum (Nutt.) Watson, Bibl. Index 416. 1878. FIG. 6.

C. dasycarpum Nutt. in Torr. & Gray, Fl. **1**: 638. 1840.
C. procumbens dasycarpum C. & R. Bot. Gaz. **12**: 160. 1887.

Fruit pubescent, the intervals sometimes broader than the ribs.

Type locality not given; collected by *Nuttall;* type in Herb. Gray.

From Mississippi to eastern Texas.

Specimens examined:

MISSISSIPPI: Biloxi, *Tracy* 4469, March 3, 1888.

TEXAS: Hempstead County, *Hall* 260, June 12, 1872; near Dallas, *Reverchon* 362, May, 1876; Tom Green County, *Tweedy* 187, May, 1880; Gillespie County, *Jermy* 141, 249; San Diego, *Mary B. Croft*, in 1885; Nueces County, *Heller* 1521, April 3, 1894; near Houston, *Rose* 4189, May 6, 1899.

Chaerophyllum tainturieri floridanum C. & R., var. nov.

Fruit glabrous, but the prominent ribs somewhat narrower than the intervals.

Type locality, shell banks, Sister Islands, St. Johns River, Florida; collected by *A. H. Curtiss*, no. 1040, March, 1880; type in U. S. Nat. Herb.

Florida and South Carolina, and at a single station in Missouri.

Specimens examined:

FLORIDA: Near Jacksonville, *Curtiss* 1039, April, 1879; type as cited above; near Jacksonville, *Curtiss* 4339, 4653, April, 1893 and 1894.

SOUTH CAROLINA: Columbia, *Miss Crawford*, June, 1891.

MISSOURI: Eagle Rock, *Bush* 62, June 18, 1897.

For introduced species, see page 251.

7. WASHINGTONIA Raf. Am. Month. Mag. 2:176. 1818.

Osmorhiza Raf. Am. Month. Mag. **2**: 176. 1818.
Glycosma Nutt. in Torr. & Gray, Fl. **1**: 639. 1840.
Myrrhis § *Glycosma* Gray, Proc. Am. Acad. **7**: 346. 1867.

Calyx teeth obsolete. Fruit linear to linear-oblong, more or less attenuate at base, obtuse, acute, or beaked at apex, glabrous or bristly on the ribs. Carpel slightly flattened dorsally or not at all, often tapering into a long caudate attenuation at base, nearly pentagonal in section, with equal ribs, thin pericarp, and a well-defined group of strengthening cells beneath each rib. Stylopodium conical, sometimes depressed; styles mostly short. Oil tubes obsolete in mature fruit (often numerous in young fruit). Seed face from slightly concave to deeply sulcate.

Glabrous to hirsute perennials, from thick aromatic roots, 3 to 9 dm. high, with ternately decompound leaves, broad ovate to lanceolate variously toothed leaflets, involucre and involucels few-leaved or wanting, and white or purple flowers in few-rayed and few-fruited umbels.

Type species, *Myrrhis claytoni* Michx. Fl. **1**: 170. 1803.

A group of about 16 species, chiefly found in the United States and Canada, only 4 species occurring beyond our boundaries in Mexico, South America, and eastern Asia.

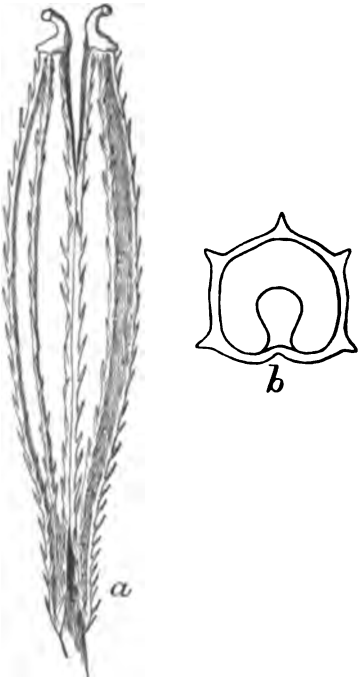


FIG. 7.—Washingtonia brachypoda: a, × 4; b, × 8.

The priority of the name *Washingtonia* rests upon the fact that it is mentiond before *Osmorhiza* in a list of three possible names suggested by Rafinesque for the new genus. In the same sentence he expresses a preference for *Osmorhiza*, and later formally establishes the genus under that name, by which it has been known ever since. It is under protest that we displace a name of such long use for what seems to be so trivial a reason, but the name *Washingtonia* will continue to be put forward in accordance with a technical interpretation of the law of priority.

In reexamining the claims of *Glycosma* Nutt. to generic rank we find no occasion to change the decision reached in our former Revision, to which (p. 117) we would refer for a full statement of the case. In his revision of the Umbelliferæ for Engler and Prantl's *Nat. Pflanzenfamilien* Dr. Drude has reached the same conclusion.

OSMORHIZA.—Fruit with bristly ribs; carpel with long caudate attenuation (except *W. brachypoda*).

Involucels of several bractlets.
  Carpel with long attenuation; eastern species.
    Style very short (less than 1 mm.) .... 1. *W. claytoni.*
    Style longer (2 mm. or more) .... 2. *W. longistylis.*
  Carpel short attenuate at base; Californian species .... 3. *W. brachypoda.*
Involucels none.
  Flowers white.
    Fruit obtuse at apex.
      Foliage strigose-pubescent; leaflets obtuse or acutish .... 4. *W. nuda.*
      Foliage almost glabrous; leaflets acute or acuminate .... 5. *W. obtusa.*

Fruit beaked or constricted at apex.
  Foliage almost glabrous.
    Fruit with conspicuous sharp beak........................ 6. *W. divaricata.*
    Fruit constricted below the apex and with truncate tip...... 7. *W. leibergi.*
  Foliage strigose-pubescent.................................. 8. *W. brevipes.*
Flowers purple.. 9. *W. purpurea.*

GLYCOSMA.—Fruit glabrous; carpel without caudate attenuation, mostly obtuse at base.

Fruiting rays usually erect, forming a compact cluster of fruits.. 10. *W. occidentalis.*
Fruiting rays spreading, forming a loose umbel.
  Foliage puberulent; seed face deeply sulcate.................... 11. *W. bolanderi.*
  Foliage glabrous; seed face slightly concave.................... 12. *W. ambigua.*

1. **Washingtonia claytoni** (Michx.) Britton, Ill. Fl. **2**: 530. 1897.

Myrrhis claytoni Michx. Fl. Bor. Am. **1**: 170. 1803.
Osmorhiza brevistylis DC. Prodr. **4**: 232. 1830.

Rather stout, villous-pubescent; leaves 2 to 3-ternate; leaflets 5 to 7.5 cm. long, acuminate, much cleft and toothed; umbel 4 to 6-rayed, with involucre and involucels of few bracts; rays stout, somewhat spreading, 2.5 to 5 cm. long; pedicels 6 to 20 mm. long; fruit (not including the attenuation) 12 mm. long, 2 mm. wide, bristly on the ribs; stylopodium and style 1 mm. long, the former slender conical; seed face less deeply concave than in *W. longistylis*.

Type locality, "in montibus Alleghanis."

In woods, Nova Scotia to the mountains of North Carolina, and westward to Minnesota, Nebraska, Missouri, and Alabama.

Specimens examined:

MAINE: Aroostook County, *Fernald* 51, July 10, 1893; Leeds, *Jennie M. Haskell*, August, 1893.

VERMONT: Peacham, *Alice F. Stevens*, June–September, 1892; Manchester, *M. A. Day* 84, July 1, 1898.

MASSACHUSETTS: Near Boston, *Biltmore Herb.* 1362c.

NEW YORK: Near Ithaca, *Cornell Univ. Coll.*, May, 1875; near Van Cortlandt, *Pollard*, June, 1893; Greene County, *Nash*, July 2, 1893.

PENNSYLVANIA: Lancaster County, *Small & Heller*, May 22, 1891.

NEW JERSEY: Bergen County, *Nash*, July 11, 1891; near Guttenberg, *Van Sickle*, May, 1893 and 1895; Tenafly, *Pollard*, May 26, 1894.

DISTRICT OF COLUMBIA: Near Washington, *Vasey*, in 1877; High Island, *Pollard* 252, May 19, 1895.

NORTH CAROLINA: In the mountains, *Vasey*, in 1878; Paint Rock, *Biltmore Herb.* 1362, May 7, 1896; Hot Springs, *Biltmore Herb.* 1362*b*, April 27, 1897.

ALABAMA: Monte Sano, *Baker*, May 23, 1897.

WEST VIRGINIA: Upshur County, *Pollock*, May 19, 1897.

OHIO: Lancaster, *Bigelow;* Niles, *Ingraham*, May, 1891; Lorain County, *Ricksecker*, in 1894.

MICHIGAN: Alma, *Davis*, August 28, 1891.

ILLINOIS: Near Peoria, *Brendel*, in 1873; near Naperville, *Umbach*, June 2, 1898.

MISSOURI: Jackson County, *Bush* 561, 867, May–June, 1896.

IOWA: Fayette County, *Fink* 76, May 29, 1894.

MINNESOTA: Near Fort Snelling, *Mearns* 401, in 1890 and 1891.

NEBRASKA: Near Ponca, *Clements* 2564, June 15, 1893.

2. **Washingtonia longistylis** (Torr.) Britton, Ill. Fl. **2**: 530. 1897.

Myrrhis longistylis Torr. Fl. U. S. 310. 1824.
Osmorhiza longistylis DC. Prodr. **4**: 232. 1830.

Stout, from sweet aromatic roots, glabrous or glabrate (sometimes quite pubescent when young); leaves, umbels, and fruit as in *W. claytoni*; stylopodium slender conical, 1 mm. long, bearing a style 2 mm. or more long; seed face deeply and broadly concave.

Type locality, "in wet meadows near Albany, New York, etc.;" the only original specimen now in Herb. Torrey is labeled "Montreal;" type in Herb. Columbia Univ.

In woods, Nova Scotia to the mountains of North Carolina and Alabama, and westward to the Black Hills, eastern Montana, and foothills of Colorado.

Specimens examined:

ONTARIO: Kingston, *Fowler*, July 8, 1895.
MASSACHUSETTS: Near Boston, *Biltmore Herb.* 674c.
CONNECTICUT: Near Greens Farms, *Pollard* 37, June 7, 1894.
PENNSYLVANIA: Union County, *Noll;* near Lancaster, *Small*, April–June, 1889.
DISTRICT OF COLUMBIA: Near Washington, *Vasey*, in 1875; banks of Canal, *Pollard* 177, May 8, 1895; shores of Potomac, *Braendle* 10, May 12, 1898.
NORTH CAROLINA: Near Biltmore, *Biltmore Herb.* 674, in 1897.
GEORGIA: Northern Georgia, *Vasey*, in 1878.
ALABAMA: Near Tuscaloosa, *Ward*, April 11, 1892.
WEST VIRGINIA: Upshur County, *Pollock*, May 22, 1897.
TENNESSEE: Knoxville, *Ruth* 429, May, 1898.
OHIO: Lancaster, *Bigelow;* Niles, *Ingraham*, May, 1891; Lorain County, *Ricksecker*, May 19, 1894.
ILLINOIS: Near Naperville, *Umbach*, June 2, 1898.
IOWA: Fayette County, *Fink* 77, May 15, 1894.
MINNESOTA: Center City, *Taylor*, June, 1892.
SOUTH DAKOTA: Black Hills, *Rydberg* 725, in 1892; Union County, *Wallace*, September, 1892.
MONTANA: Lower Falls of Missouri, *Williams* 275, June 15, 1886.
COLORADO: Foothills, Laramie County, *Osterhout*, August 7, 1896.

3. **Washingtonia brachypoda** (Torr.) Heller, Cat. N. Am. Pl. 5. 1898. FIG. 7.

Osmorhiza brachypoda Torr. Jour. Philad. Acad. II. **3**: 89. 1855.

Stout, from sweet aromatic roots, pubescent or sometimes glabrous; leaves ternately compound (often appearing pinnate after the first division); leaflets 2 to 3 cm. long, acute, laciniately lobed or toothed; umbel 1 to 6-rayed, with involucre and involucels of linear bracts, the latter equaling or exceeding the flowers; rays 3.5 to 10 cm. long; pedicels 1 to 2 mm. long; fruit 12 to 16 mm. long, 4 mm. wide, short attenuate at base, rough-bristly on the very prominent ribs; stylopodium and style 1 mm. long, the former broad and somewhat depressed; seed face very deeply concave, nearly inclosing a central cavity.

Type locality, "near the banks of Deer Creek," in the vicinity of

Nevada City, Nevada County, Cal.; collected by *Henry Pratten* in 1851.

California, from Sierra County southward.

Specimens examined:

CALIFORNIA: San Bernardino Mountains, *Canby* 228, May, 1880; San Diego County, *Orcutt*, May, 1889; Kern County, *Greene*, June 24, 1889; Kern County, *Coville & Funston* 1171, July 6, 1891; near San Isabel, *Henshaw*, April 29, 1893; San Bernardino Mountains, *Parish* 3479, 4165, in 1894 and 1896; same station, *Leiberg* 3321, April 22, 1898.

4. **Washingtonia nuda** (Torr.) Heller, Cat. N. Am. Pl. 5. 1898.

Osmorhiza nuda Torr. Pacif. R. Rep. 4^1: 93. 1856.
Uraspermum nudum Kuntze, Rev. Gen. Pl. 1: 270. 1891.
Myrrhis nuda Greene, Man. Bot. Bay Reg. 157. 1894.

Rather slender, about 6 dm. high, lower part of stem and foliage strigose pubescent, upper part of stem glabrous; basal leaves on long petioles; leaflets broadly ovate, 2 to 5 cm. long, obtuse or acutish, often deeply 3-lobed, coarsely dentate-serrate; umbels on elongated peduncles, with 3 or 4 spreading rays 7.5 to 10 cm. long, and 2 to 6 pedicels much longer than the fruit, sometimes 3 cm. long; fruit (immature) very hispid, especially at base, apparently obtuse; stylopodium 0.5 mm. long, as broad as high, longer than the style.

Type locality, "shady woods, Napa Valley," Cal.; collected by *Bigelow*, April 27, 1853 or 1854; type in Herb. Columbia Univ.

Central California, in the coast region.

Specimens examined:

CALIFORNIA: Santa Lucia Mountains, Monterey County, *R. A. Plaskett*, March, 1898.

5. **Washingtonia obtusa** C. & R., sp. nov.

Resembles *W. nuda*, but more slender and lower, almost glabrous; leaflets ovate to lanceolate, acute or acuminate, more sharply toothed; umbel with very widespreading rays (lateral ones even deflexed); the 2 to 4 pedicels 12 to 25 mm. long, longer than the fruit, which is about 16 mm. long, obtuse (often slightly pointed just at the tip), and less pubescent; stylopodium 0.5 mm. long or less.

Type locality, Ishawood Creek, northwestern Wyoming; collected by *Rose*, no. 476, August 8, 1893; type in U. S. Nat. Herb.

A species of the Rocky Mountain region and extending into the northeastern border of California.

Specimens examined:

BRITISH COLUMBIA: Kicking Horse Lake, Rocky Mountains, *Macoun*, July 23, 1885.

WYOMING: Yellowstone Park, *Tweedy*, July, 1885; *Rose* 476, as cited under type locality; Centennial Valley, *Nelson* 1722, in 1895.

COLORADO: Estes Park, *Ball*, July, 1884; continental divide west of North Park, altitude 2,210 meters, *Crandall* 187, July 20, 1894; Telluride, altitude 3,000 meters, *Tweedy* 206, August 25, 1894; Empire, *Bethel*, July, 1895; near Cameron Pass, 2,850 meters, *Baker* 8, July 17, 1896; West Mancos Cañon, altitude 2,700 to 3,000 meters, *Baker, Earle & Tracy* 188, June 28, 1898; La Plata

Cañon, *Baker, Earle & Tracy* 849, July 11, 1898; west of Mount Hesperus, *Baker* 188, 250, April–June, 1898.

NEW MEXICO: Santa Fé Canyon, altitude 2,400 meters, *A. A. & E. Gertrude Heller* 3822, July 7, 1897.

ARIZONA: San Francisco Mountains, *Toumey* 39, July 15, 1892; about Mormon Lake, altitude 1,800 meters, *MacDougal* 101, July 12, 1898; Humphreys Peak, San Francisco Mountains, altitude 2,700 to 3,600 meters, *MacDougal* 397, August 7–10, 1898.

UTAH: Wahsatch Mountains, altitude 2,100 meters, *Watson* 446, July, 1869; mountains east of Gunnison, altitude 2,580 meters, *Ward* 293, June 28, 1875; near Provo, altitude 2,400 meters, *Jones* 5580, July 3, 1894.

CALIFORNIA: Sierra County, *Lemmon*, in 1883 and 1889.

6. **Washingtonia divaricata** Britton, Ill. Fl. **2**: 531. 1897.

W. intermedia Rydberg, Mem. N. Y. Bot. Garden **1**:289. 1900.

Resembles *W. nuda*, but 3 to 7 dm. high, and nearly glabrous; leaflets thin and larger, becoming 6 cm. long, lanceolate to ovate, acute to acuminate, coarsely toothed and usually incised; umbels with 2 to 9 spreading rays, and pedicels 10 to 18 mm. long, usually about as long as the fruit, sometimes longer or shorter; fruit 16 to 20 mm. long, with a distinct beak 2 mm. long; stylopodium and style 1 mm. long, the former not so broad as high and longer than the very short style.

Type locality, "Oregon;" collected by *Nuttall;* type in Herb. Columbia Univ.

From Oregon and northern California to South Dakota, and northward to Alaska.

Specimens examined:

ALASKA: Sitka, *Kellogg* 172, in 1867; Point Gustavus, Glacier Bay, *Coville & Kearney* 726, June 10–12, 1899; Douglas and Baranoff Islands, *Trelease* 4527, 4528, June–July, 1899.

WASHINGTON: Puget Sound, *Wilkes Exped.* 365; Yakima Region, *Tweedy*, August, 1882; *G. R. Vasey* 306, in 1889; Rock Creek, Spokane County, *Suksdorf* 1195, June 5, 1889; Olympia and Yakima counties, *Henderson* 376, in 1892; upper valley of the Nesqually, Cascade Mountains, *Allen* 34, August 28, 1893.

OREGON: Crater Pass, Cascade Mountains, *Newberry;* near Fort Klamath, altitude 1,470 meters, *Leiberg* 681, August 8, 1894; Cougar Peak, altitude 1,920 meters, *Coville & Leiberg* 197, August 3, 1896.

CALIFORNIA: Sierra County, *Lemmon* 26, August, 1883; Mendocino County, *Brown* 852, June, 1898.

IDAHO: Nez Perces County, *Sandberg* 168, May 14, 1892; Moscow Mountains, *Henderson*, in 1894; head of Pettit Lake, *Henderson* 3614, July 29, 1895; near Sohan's Pass, altitude 1,650 meters, *Leiberg* 427, August 1, 1895; Nez Perces County, altitude 450 to 600 meters, *A. A. & E. Gertrude Heller* 3137, 3385, May–July, 1896; Rush Creek, Salubria, Washington County, *Jones*, July 10, 1899.

UTAH: City Creek Canyon, altitude 1,890 meters, *Jones* 1852, July 13, 1880.

MONTANA: Helena, *Kelsey*, in 1887; near Red Lodge, *Rose* 30, July 26, 1893; Columbia Falls, *Williams* 615, June, 1893 and 1894; Spanish Basin, Madison Range, altitude 1,800 meters, *Flodman* 687, July 11, 1896; Bridger Mountains, altitude 2,100 meters, *Rydberg & Bessey* 4595, June 17, 1897 (type of *W. intermedia* Rydberg).

WYOMING: Teton Mountains, *A. & E. Nelson* 6473, August 16, 1899.

SOUTH DAKOTA: Lead City, Black Hills, altitude 1,650 to 1,950 meters, *Rydberg* 724, July 6, 1892.

The specimen from Mendocino County, Cal. (*Brown* 852), is more pubescent than usual, and seems to be somewhat out of the range, but we can make no other reference of it at present.

7. **Washingtonia leibergi** C. & R., sp. nov.

Resembles *W. nuda*, but almost glabrous; leaflets thin, ovate to lanceolate, acuminate or acute, more sharply toothed; umbels not widely spreading; pedicels about 10 to 15 mm. long, longer than the immature fruit; fruit but slightly hispid at base and nearly glabrous above, distinctly constricted below the truncate tip; stylopodium very low and flat, or sometimes even obsolete.

Type locality, Nason Creek, branch of Wenatchee River, Kittitas County, Washington; collected by *Sandberg & Leiberg*, no. 666, August 4, 1893; type in U. S. Nat. Herb.

Mountains of Washington and Idaho.

Specimens examined:

WASHINGTON: Mount Paddo (Adams), altitude 1,500 to 1,800 meters, *Suksdorf* 1194, July 12, 1886; Olympic Mountains, *Piper* 911, September 30, 1890; *Sandberg & Leiberg* 666, as cited under type locality.

IDAHO: Packsaddle Peak, Kootenai County, *Sandberg* 845, August 6, 1892.

8. **Washingtonia brevipes** C. & R., sp. nov.

Resembles *W. nuda* in habit and strigose pubescence, but umbels with 3 to 7 rays, and pedicels 4 to 12 mm. long, shorter than the fruit, which is 14 to 16 mm. long, with a distinct beak 2 mm. long, and bearing a stylopodium sometimes even shorter than that of *W. nuda*.

Type locality, Mount Shasta and vicinity, Siskiyou County, Cal.; collected by *Palmer*, no. 2481, July 13–27, 1892; type in U. S. Nat. Herb.

From northern Washington to southern California, and adjacent Idaho.

Specimens examined:

CALIFORNIA: Ukiah, Mendocino County, *Bolander* 4649, in 1866; Sonoma County, *E. Samuels* 96; Plumas County, *Mrs. R. M. Austin;* Emigrant Gap, Placer County, *Jones* 2734, June 29, 1882; Sierra County, *Lemmon*, in 1883; Plumas County, *Lemmon*, June 4, 1889; Kaweah River Valley, Tulare County, *Coville & Funston* 1362, in 1891; Amador County, *Hansen* 331, April 19, 1892; Bolinas Ridge, Marin County, *Palmer* 2301, June 14–16, 1892; Mount Shasta and vicinity, Siskiyou County, *Palmer* 2481, July 13–27, 1892; Cuyamaca Mountains, San Diego County, altitude 1,380 meters, *Parish* 4421, June 5–7, 1897.

OREGON: Near Portland, *Kellogg & Harford* 311, May 24, 1869.

WASHINGTON: Near Seattle, *Smith* 110, April 23, 1889; same station, *Piper* 110, July, 1891; Falcon Valley, *Suksdorf* 2115, May–June, 1892; *Sheldon* 8058, in 1897; Blue Mountains, *Horner* 215, August 9, 1897; Chehalis County, *A. A. & E. Gertrude Heller* 3975, June 28, 1898; Mount Stuart, Cascades, Kittitas County, *Elmer* 1176, August, 1898.

IDAHO: Payette Lake, Canyon County, *Jones*, July 10, 1899.

9. **Washingtonia purpurea** C. & R., sp. nov.

Slender or sometimes rather stout, from a thick elongated root, 1 to 6 dm. high, nearly glabrous; basal leaves clustered and often short-petioled, once to twice ternate as are the stem leaves; leaflets ovate to lanceolate, acute to acuminate, irregularly and sharply-lobed and toothed, 2 to 7 cm. long; fruiting umbels widely spreading, of 2 to 4 rays 5 to 7.5 cm. long; pedicels 2 to 4, longer than the fruit, 12 to 20 mm. long; flowers bright purple; fruit slightly hispid at base and glabrous above, 10 to 12 mm. long, slightly beaked at apex; stylopodium prominent and flat (the two stylopodia forming a conspicuous disk), the short style arising from its inner edge.

Type locality, Sitka, Alaska; collected by *Coville & Kearney* on the Harriman expedition, No. 796, June 14–17, 1899; type in U. S. Nat. Herb.

Mountains of northern Oregon to Alaska.

Specimens examined:

Oregon: Mount Hood, *Henderson*, September, 1884.

Washington: Chehalis County, on peak at altitude of 900 to 1,050 meters, *Lamb* 1382, August 4, 1897.

British Columbia: Mountains near Kootenai Lake, *Macoun*, July 9, 1890.

Alaska: Juneau, *Grace E. Cooley*, July 24, 1891; Mount Verstovia, Sitka, *Evermann* 223, August 14, 1892; Yes Bay, *Gorman* 23, June 6, 1895; Juneau, Sitka, and Port Wells (Prince William Sound), *Coville & Kearney* 590, 796, 1264, June 6–26, 1899; Baranoff Island, *Trelease* 4525, June 14, 1899; Yakutat Bay, *Saunders* 4526, June 20, 1899.

10. **Washingtonia occidentalis** (Nutt.) C. & R.

Glycosma occidentalis Nutt. in Torr. & Gray Fl. 1:639. 1840.
Osmorhiza occidentalis Torr. Bot. Mex. Bound. 71. 1859.
Myrrhis occidentalis Benth. & Hook. Gen. Pl. 1:897. 1867.

Rather stout, puberulent (stems sometimes glabrous or pubescent at the nodes); leaves 2 or 3-ternate; leaflets lanceolate-oblong, 3.5 to 10 cm. long, acute, coarsely serrate, rarely incised; umbel 5 to 12-rayed, naked or with 1 or 2 involucral bracts; fruiting rays 2.5 to 12.5 cm. long, usually erect and forming a somewhat compact cluster of fruits; pedicels 2 to 8 mm. long; fruit 12 to 16 mm. long, obtuse at base, glabrous, distinctly beaked, and with prominent acute ribs; stylopodium and style 1 to 2 mm. long, the former mostly conical; seed face strongly concave.

Type locality, "western side of the Blue Mountains of Oregon;" collected by *Nuttall;* type in Herb. Columbia Univ.

From Alberta to northern California and the mountains of Colorado.

Specimens examined:

Alberta: Watertown Lake, *Macoun* 10678, July 28–31, 1895.

Washington: *Wilkes Exped.* 508; *Dr. Cooper;* Simcoe Mountains, *Suksdorf* 1198, June 6, 1884; *G. R. Vasey* 304, in 1889; Eastern Cascade Mountains, *Henderson* 377, June 11, 1892; *Sandberg & Leiberg* 502, in 1893; Blue Mountains, Wallawalla County, *Piper* 2334, July 16, 1896; Wenatchee, *Whited*, June

28, 1896; Blue Mountains, *Horner* 217, May 18, 1897; head of Poison Creek, altitude 1,530 meters, *Gorman* 669, September 1, 1897.

OREGON: Morrow County, altitude 790 meters, *Leiberg* 99, May 22, 1894; Steins Mountains, altitude 1,820 meters, *Leiberg* 2490, July 5, 1896; Blue Mountains, *Cusick* 1816, 1817, 1819, August, 1897.

IDAHO: Kootenai County, *Sandberg*, July, 1881; Nez Perces County, *Sandberg* 108, May 3, 1892; Moscow Mountains, *Henderson* 2661, 2662, July–August, 1894; Pettit Lake, altitude 2,160 to 2,250 meters, *Evermann* 337, August 14, 1895; Soldier Mountain, altitude 3,000 meters, *Henderson* 3182, July 15, 1895; near Salmon, altitude 2,460 meters, *Henderson* 4069, August 27, 1895; Stevens Peak, altitude 534 meters, *Leiberg* 444, August 3, 1895; Nez Perces County, altitude 1,050 meters, *A. A. & E. Gertrude Heller* 3451, July 16, 1896; near Sawtooth, *Evermann* 562, 658, July 9–28, 1896; Henrys Lake, *Rydberg* 4598, July 31, 1897; Seven Devils Mountains, *Jones*, August 5, 1899.

MONTANA: Near Helena, *Kelsey*, June 21, 1889; *Williams* 196, July 25, 1894; Bridger Mountains, altitude 2,100 meters, *Flodman* 690, July 28, 1896; Spanish Basin, Madison Range, altitude 1,800 meters, *Flodman* 688, July 11, 1896; Bridger Mountains, *Rydberg* 4597, June 12, 1897.

WYOMING: Carbon County, *Nelson* 4191, August 16, 1897; Teton Mountains, *A. & E. Nelson* 6472, August 16, 1900.

COLORADO: Steamboat Springs, *Alice Eastwood*, in 1891; same station, *Crandall*, July 25, 1891; Delta County, altitude 2,100 meters, *Cowen* 17, August 2, 1893; Williams Park, altitude 2,400 meters, *Bethel* 3614, August 15, 1895; Steamboat Springs, altitude 2,100 meters, *Baker* 3, July 22, 1896; La Plata Mountains, altitude 3,000 meters, *Baker, Earle & Tracy* 177, June 26, 1898; Mount Hesperus, altitude 3,000 meters, *Baker* 177, June 26, 1898.

UTAH: Near Ogden, *Letterman*, July 29, 1885; Provo, *Tracy* 684, August 16, 1887; same station, altitude 2,400 meters, *Jones* 5581, July 3, 1894.

NEVADA: Humboldt Mountains, *Torrey*, in 1865; same station, *Watson* 447, August, 1868.

CALIFORNIA: Nevada County, *Jones* 2511, July 25, 1881; Plumas County, *Lemmon* 44, July 28, 1889, Lassens Peak, *Mrs. Austin*, August, 1896.

The specimen from Provo, Utah, collected by *Tracy* (no. 684), August 16, 1887, seems to be this species, but the fruits are 20 mm. long.

11. **Washingtonia bolanderi** (Gray) C. & R.

Myrrhis bolanderi Gray, Proc. Am. Acad. **7**: 346. 1868.
Glycosma bolanderi Gray, Proc. Am. Acad. **8**: 386. 1872.
Osmorhiza occidentalis bolanderi C. & R. Rev. N. Am. Umbell. 119. 1888.

Stout, 9 to 10 dm. high, somewhat pubescent at the nodes, and the foliage puberulent; leaflets broadly ovate, coarsely serrate or toothed, 5 cm. long or less; fruiting rays somewhat spreading, 3 to 6 cm. long; pedicels 2 to 4 mm. long, shorter than the sterile flowers; fruit 20 mm. long, with a stout beak; stylopodium flat, much shorter than the style; seed face deeply sulcate.

Type locality, "Lamberts Lake, Mendocino County," Cal., collected by *Bolander* in 1867; type in Herb. Gray.

Mendocino County, Cal.

Specimens examined:

CALIFORNIA: Type specimen as cited under type locality; Cahto, Mendocino County, *Kellogg & Harford* 312, May 24, 1869.

The Cahto specimens cited above, and in the Botany of California referred by Watson to *W. ambigua*, are clearly to be associated with *W. bolanderi*. They are less puberulent than the type specimens of that species, and the fruit is considerably smaller (14 to 16 mm. long).

12. **Washingtonia ambigua** (Gray) C. & R.

Glycosma ambiguum Gray, Proc. Am. Acad. **8**: 386. 1872.
Osmorhiza ambigua C. & R. Rev. N. Am. Umbell. 119. 1888.

Glabrous, or hairy near the nodes; leaves 2 to 3-ternate; leaflets broadly ovate, thin, 2.5 to 6.5 cm. long, acute, serrate, and more incised than in *W. occidentalis;* umbel 4 to 8-rayed, naked; fruiting rays 3 to 6 cm. long, widely spreading; pedicels 2 to 10 mm. long; fruit 12 to 18 mm. long, acutish at base, glabrous, and distinctly beaked; stylopodium slightly conical, style 1 mm. long; seed face slightly concave.

Type locality, "foot of Cascade Mountains, Oregon;" collected by *Hall*, no. 217, in 1871; type in Herb. Gray.

Mountains of Oregon and Washington.

Specimens examined:

OREGON: Type specimen as cited under type locality; Oakland, *Howell* 178, April, 1881; Wolf Creek, Josephine County, *Howell* 124, May 23, 1884.

WASHINGTON: Falcon Valley, *Suksdorf* 382, July, 1880; Mount Paddo (Adams), *Suksdorf* 1197, August 10, 1882; same station, *Henderson*, in 1882; same station, *Suksdorf* 1196, September 18, 1884; same station, altitude 1,800 to 2,100 meters, *Suksdorf*, June-August, 1885; Goat Mountains, altitude 1,350 meters, *Allen* 256, August 8–September 19, 1896.

In examining the type specimen we find that the character "ribs toward the base more or less setose" is based upon a single detached fruit, which proves to belong to *W. purpurea*. All the other fruits on the type sheet are completely glabrous.

Specimens collected by *Howell* at Grant's Pass, Josephine County, Oreg. (no. 123, May 25 and June 21, 1884), and at Oakland, Oreg. (no. 178, April, 1881), seem to belong to *W. ambigua*, but they are quite pubescent.

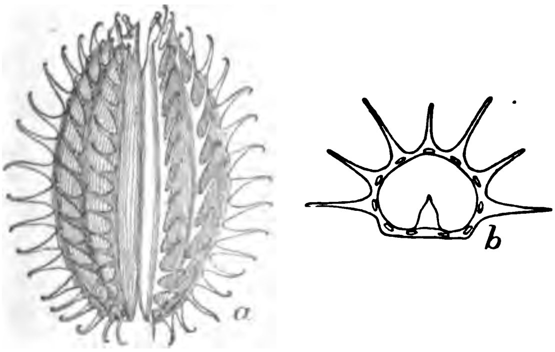


FIG. 8.—Caucalis microcarpa: *a*, *b*, × 8.

8. CAUCALIS L. Sp. Pl. 1: 240. 1753.

Calyx teeth prominent. Fruit ovate or oblong, flattened laterally. Carpel with 5 filiform bristly primary ribs (each with a prominent group of strengthening cells) and 4 prominent winged secondary ones (without strengthening cells) with barbed or hooked prickles. Stylopodium thick conical. Oil tubes solitary in the intervals (under the secondary ribs), 2 on the commissural side. Seed face deeply sulcate.

Mostly hispid annuals (ours), with pinnately dissected leaves (with very small segments) and white flowers. The primary lateral ribs are pushed around upon the commissural face, making a very narrow commissure, while the adjoining secondary ribs become marginal. Closely resembles *Daucus*.

The first species cited by Linnæus is *C. grandiflora*, which has proved to be a *Daucus;* the second species cited is *C. daucoides*, a true *Caucalis*.

A group of 5 species, as restricted by Drude, but one of which is native in the Western Hemisphere.

1. **Caucalis microcarpa** Hook. & Arn. Bot. Beechey, 348. 1840.

FIG. 8.

Erect, slender, 7.5 to 37.5 cm. high, more or less hispid and sometimes glabrate; leaves much dissected; umbels at the ends of stem and branches, very unequally 3 to 6-rayed, with involucre of foliaceous divided bracts, and involucels of entire or somewhat divided bractlets; rays slender, 7.5 cm. or less long; pedicels very unequal; fruit oblong, 4 to 6 mm. long, armed with rows of hooked prickles; the primary lateral ribs near margin of commissural face.

Type locality, California; collected by *Douglas*.

From Washington and Idaho to southern California and Arizona, and extending into Mexico.

Specimens examined:

WASHINGTON: Klickitat County, *Suksdorf* 16, June 1, 1881; near Pullman, Whitman County, *Henderson* 1346, June, 1892; Wawawai, Whitman County, *Piper*, May 19, 1894; same station, *Elmer* 93, May, 1897.

IDAHO: Nez Perces County, *Sandberg* 328, June 16, 1892; same station, *A. A. & E. Gertrude Heller* 3097, May 20, 1896.

OREGON: John Day Valley, *Howell*, May, 1885.

CALIFORNIA: *Bigelow*, in 1853–54; *Bolander* 4699, in 1866; *Kellogg & Harford* 1160, in 1868–69; near Los Angeles, *Hasse*, April, 1888 and 1891; Oakland Hills, *Lemmon* 62, in 1889; near San Diego, *Orcutt;* Little Chico Canyon, *Mrs. Bruce* 69, May, 1896; Santa Catalina Island, *Blanche Trask*, March, 1897; North Fork of San Gabriel River, altitude 550 meters, *Leiberg* 3398, May 10, 1898.

NEVADA: Mica Spring, altitude 1,200 meters, *Jones* 5045, April 13–14, 1894.

UTAH: Silver Reef, altitude 1,050 meters, *Jones* 5163, May 4, 1894.

ARIZONA: Thumb Butte, Prescott, *Rusby*, May 28, 1883; Sierra Tucson, *Pringle*, April 15, 1884; near Tucson, *Toumey* 194, April 12, 1892; Pierce's Spring, altitude 450 meters, *Jones* 5077, April 18, 1894.

For introduced species see page 252.

9. **BIFORA** Hoffm. Umb. Gen. ed. 2. 191. 1816.

Calyx teeth evident. Fruit broader than long, flattened laterally, the globose carpels in contact only by a narrow commissure. Carpel with 4 filiform secondary ribs and thin very hard pericarp. Stylopodium conical, with styles recurved over the carpels. Oil tubes none. Seed face deeply concave.

Slender smooth annuals, with leaves pinnately dissected into filiform segments, involucre and involucels of few small bracts, and white flowers in few-rayed umbels.

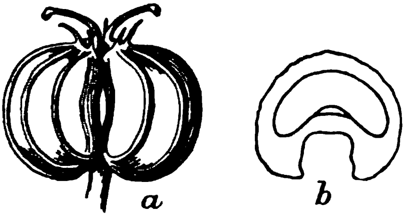


Fig. 9.—Bifora americana: *a, b,* × 6.

Type species, *B. dicocca* Hoffm. l. c., of Europe and the Orient.

A group of 5 species, 4 of which are distributed throughout Europe and Asia, and a single one in North America, almost entirely restricted to the dry plains of Texas.

1. **Bifora americana** (DC.) Watson, Bibl. Index 415. 1878. Fig. 9.

Atrema americana DC. Coll. Mém. **5**: 71. pl. 18. 1829.
Anidrum americanum Kuntze, Rev. Gen. Pl. **1**: 264. 1891.

Stems 3 dm. or more high, branching above; umbels 5 to 8-rayed; rays 12 to 18 mm. long; pedicels about 2 mm. long; fruit 3 mm. long, 5 mm. broad.

Type locality, "près de la rivière Rouge;" collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Philad. Acad.

Dry ground, throughout Texas, and extending into the borders of Indian Territory and probably Arkansas.

Specimens examined:

Texas: *Lindheimer* 405, in 1846–1848; Nueces region, *Wright* 1108, in 1851; Burton, *Hall* 262, May 25, 1872; near Dallas, *Reverchon* 374, May, 1879; Gillespie County, *Jermy* 139; near San Sabin, *Nealley* 156, July, 1890; Brazos County, *Dewey*, June 9, 1891; Kerr County, *Heller* 1656, May 14–21, 1894; Industry, *Wurzlow*, May, 1895.

Indian Territory: Near Caddo, *Sheldon* 41, June 20, 1891.

For introduced species see page 252.

10. APIASTRUM Nutt. in Torr. & Gray, Fl. 1: 643. 1840.

Calyx teeth obsolete. Fruit ovate or cordate, with obscure or obsolete ribs, more or less tuberculate. Carpel with thin pericarp and no strengthening cells. Stylopodium minute and depressed, with short style. Oil tubes solitary in the intervals and beneath the ribs, 2 on the commissural side. Seed face narrowly concave or sulcate.

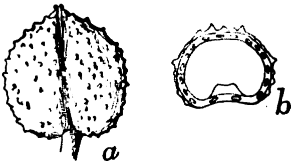


Fig. 10.—Apiastrum patens: *a,* × 10; *b,* × 12.

Very slender smooth branching (somewhat dichotomously annuals), with finely dissected leaves having filiform or linear (sometimes a little broader) segments, and small white flowers in naked unequally few-rayed umbels.

First species cited, *A. angustifolium* Nutt.

A North American genus containing two species, one Californian, the other in the Missouri-Texas region.

Umbels sessile; fruit cordate at base; Californian.............. 1. *A. angustifolium*.
Umbels peduncled; fruit rounded at base; Missouri-Texas............ 2. *A. patens*.

1. **Apiastrum angustifolium** Nutt. in Torr. & Gray, Fl. **1**: 644. 1840.

A. latifolium Nutt. l. c.
(?) *Helosciadium leptophyllum* (?) *latifolium* Hook. & Arn. Bot. Beechey 347. 1840.

Slender, 0.5 to 3 dm. high, sometimes simple, usually much branched; leaves 2.5 to 5 cm. long, biternately or triternately divided, with linear or nearly filiform segments (rarely linear-oblong); umbels sessile; rays from 2.5 cm. long to wanting; pedicels 1.2 cm. long to wanting; fruit with narrow commissure, cordate in outline, 1 mm. long.

Type locality, "San Diego, California;" collected by *Nuttall;* type in Herb. Gray.

California, from Mendocino County southward, and extending into Lower California.

Specimens examined:

CALIFORNIA: San Luis Rey, *Mex. Bound. Surv.*, in 1850; near Clear Lake, *Torrey* 160, in 1865; *Kellogg & Harford* 305, in 1868–69; Santa Clara County, *Mrs. Ames*, in 1877; San Diego, *Jones* 3089, March 20, 1882; same station, *Pringle*, May 4, 1882; same station, *Orcutt*, in 1886 and 1889; Oakland Hills, *Chesnut*, May 9, 1888; same station, *Lemmon* 50, in 1889; Los Angeles, *Hasse*, April, 1891; Vaca Mountains, *Jepson*, June 20, 1892; San Isabel, *Henshaw*, April 18, 1893; near San Bernardino, *Parish*, May, 1893; Amador County, altitude 120 meters, *Hansen* 1042, April 18, 1895; San Nicholas Island, *Blanche Trask*, April, 1897; Avalon, Santa Catalina Island, *Blanche Trask*, May, 1897; Monterey County, *Plaskett* 102, April, 1898.

We have not seen the Hooker and Arnott plant referred to under the synonymy. It has priority of publication, but the description is not definite enough to make us certain of this reference.

2. **Apiastrum patens** (Nutt.) C. & R. Rev. N. Am. Umbell. 110. 1888.
FIG. 10.

Leptocaulis patens Nutt. in DC. Prodr. **4**: 107. 1830.
Apium patens Watson, Bibl. Index, 413. 1878.

Slender, 3 to 6 dm. high, branching above; leaves 2.5 to 5 cm. long, ternately or biternately divided, with long filiform segments; umbels long-peduncled; rays and pedicels as in *A. angustifolium;* fruit with broader commissure, ovate, slightly larger, rounded at base.

Type locality, "Red River," Arkansas; collected by *Nuttall.*

From the southern border of Lake Michigan to Texas.

Specimens examined:

INDIANA: Along railway track, Miller, Lake County, *Umbach*, June 24, 1898.

Missouri: Jackson County, *Bush* 296, June 3, 1896; Eagle Rock, *Bush* 9, June 18, 1897; Clay County, *Mackenzie*, June 20, 1897; Atherton, *Bush* 121, June 27, 1898.

Arkansas: Decatur, *Plank*.

Indian Territory: Sapulpa and Sequoyah, *Bush* 186, 187, June, 1894.

Oklahoma: Huntsville, Kingfisher County, *Laura Blankinship*, May-June, 1896.

Texas: On the San Pedro and the Pecos, *Wright* 1106, in 1851; near Austin, *Hall* 250, May 10, 1872.

Leptocaulis inermis Nutt. in DC. Coll. Mem. **5**: 39, 1829, is certainly congeneric with this species and has even been considered by some to be only a smooth fruited form of it. An examination of Nuttall's specimens at the Philadelphia Academy of Sciences would seem to indicate a different species. A smooth fruited form was also collected by Reverchon in Texas many years ago. Collectors in the Southwest should look for this plant.

11. ERIGENIA Nutt. Gen. 1: 187. 1818.

Calyx teeth obsolete. Fruit strongly flattened laterally, nearly orbicular, notched at base and apex, glabrous, thin between the incurved carpels. Carpels strongly flattened laterally, with equal filiform ribs, very thin pericarp, and strengthening cells beneath the ribs. Oil tubes 1 to 3 in the intervals, 9 to 11 on the commissural side (from which extends a prominent corky neck-like projection, meeting its fellow from the other carpel and forming the thin area between the curved carpels). Seed face narrowly and deeply sulcate.

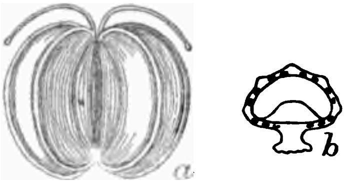


Fig. 11.—Erigenia bulbosa: *a*, ×8; *b*, ×10.

Low, glabrous, nearly acaulescent plant, from a deep-seated tuber, with ternately decompound leaves and oblong segments, no involucre (unless a reduced leaf), involucels of leafy linear or spatulate bractlets, and white flowers in small compact umbels.

A monotypic genus (based on *Sison bulbosum* Michx.) of the United States and Canada east of the Great Plains.

When Nuttall established this genus he stated that it was probably composed of two species, but only one was described or named. His idea of a second species was given in a drawing by C. W. Short. We have carefully examined much material of this genus with the idea that it might be segregated, but have not been able to see any dividing line. The early and late forms are quite different, but there seems to be no warrant for Nuttall's statement. Most of the material we have examined has been from the Northern States, but this has been carefully compared with specimens collected at Knoxville, Tenn. (the type locality of *E. bulbosa*).

1. **Erigenia bulbosa** (Michx.) Nutt. Gen. **1**: 188. 1818. Fig. 11.

Sison bulbosum Michx. Fl. Bor. Amer. **1**: 169. 1803.

Low, 2 dm. or less high; leaves basal except those subtending the imperfect umbels; pedicels very short; fruit 2 mm. long, 3 mm. broad.

Type locality, "prope Knoxville," Tenn.

Illust.: Engler & Prantl, Nat. Pflanzenfamilien 3^{8}: 165. 1898.

Range as given under the genus.

Specimens examined:

Pennsylvania: York County, *Garber*, May 4, 1868.
Maryland: Plummer Island, *Rose* 1145, April 23, 1897.
District of Columbia: Little Falls, *Vasey*, in 1873 and 1879; High Island, *Ward*, in 1879; Great Falls, *Vasey*, in 1881; High Island, *Pollard* 25, April 6, 1895.
Tennessee: Knoxville, *Ruth* 423, April, 1898; same station, *Kearney*.
Kentucky: Near Frankfort, *Williamson*, April, 1878.
Ohio: Lancaster, *Bigelow;* near Niles, *Ingraham*, May, 1891; Lorain County, *Ricksecker*, March, 1894; Collamer, *Stair*, April 20, 1895.
Indiana: Near Mattsville, *Wilson* 9, April 22, 1892.
Michigan: Bellevue, *Shoop;* near Alma, *Davis*, April 29, 1891.
Illinois: Naperville, *Umbach*, April–May, 1898.
Kansas: Baxter Springs, *Plank*.

12. **OROGENIA** Watson, Bot. King Surv. 120. 1871.

Calyx teeth minute. Fruit oblong, very slightly flattened laterally, glabrous. Carpel much flattened dorsally, with filiform dorsal and intermediate ribs; laterals excessively corky thickened, involute (that is, extended toward the other carpel, leaving between the commissural faces a cavity, which is divided longitudinally by a thick corky projection from the middle of each face); all with distinct groups of strengthening cells. Stylopodium depressed. Oil tubes very small, 3 in the intervals, 2 to 4 on the commissural side. Seed face slightly concave.

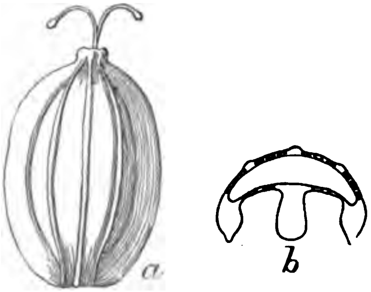


Fig. 12.—Orogenia linearifolia: *a*, *b*, × 8.

Dwarf glabrous nearly acaulescent plants, from tuberous or fusiform roots (underground part of the stem sheathed with large scarious bracts), with ternate leaves and linear segments, no involucre, involucels of few linear bractlets, and white flowers in subcompound umbels with very unequal rays.

Type species, *O. linearifolia* Watson.

A group of two species, restricted to the United States west of the Rocky Mountains.

Stems from deep-seated round tubers .... 1. *O. linearifolia.*
Stems from long fusiform roots .... 2. *O. fusiformis.*

1. **Orogenia linearifolia** Watson, Bot. King Surv. 120. pl. 14, figs. 1–3. 1871. Fig. 12.

Stem (or scape) slender, rising 2 to 12 cm. above ground from a deep-seated round tuber; leaves 2 or 3, once or twice ternate, upon slender petioles; leaflets entire, 2.5 to 5 cm. long, 2 to 6 mm. wide, obtuse; umbels 2 to 10-rayed, with nearly sessile flowers; fruit 3 to 4 mm. long, lateral ribs and commissural projection much more strongly developed than in *O. fusiformis*.

Type locality, "damp shaded ridge of the Wahsatch, north of Parleys Park, 7,500 feet altitude;" collected by *Watson*, no. 440, June 28, 1869; type in U. S. Nat. Herb.

From Washington and Idaho to Oregon, Utah, and southwestern Colorado.

Specimens examined:

WASHINGTON: "East of the Cascade Mountains to the Columbia," *Wilkes Exped.*; Falcon Valley, *Suksdorf*, May 17, 1882.

OREGON: Yamhill County, *Summers*, May, 1878; *Cusick*, in 1884.

IDAHO: *Wilcox*, in 1885.

UTAH: *Watson* 440, as cited under type localit [illegible] y Creek Canyon and Scipio, *Jones*, in 1880.

COLORADO: Mancos, *Alice Eastwood*, May 1, 1891.

2. **Orogenia fusiformis** Watson, Proc. Am. Acad. **22**: 474. 1887.

Resembling *O. linearifolia*, but stouter, 7.5 to 15 cm. above ground, from a long fusiform root; leaves more compounded, 2 to 3-ternate, with terminal leaflets often 3-parted; leaflets 2.5 cm. or less long; umbels 6 to 12-rayed; rays longer; fruit about 6 mm. long, 3 mm. broad; lateral ribs and commissural projection smaller.

Type locality, "in Plumas County, Cal.;" collected by *Mrs. R. M. Austin* in 1880; type in Herb. Gray. This is the first specimen cited in the original description, and associated with it is the following: "Among sagebrush near Truckee, Nevada County," *Sonne*, March–May, 1886.

Northeastern California (Plumas and Nevada counties) and southeastern Oregon.

Specimens examined:

CALIFORNIA: Near Prosser Creek, Nevada County, *Sonne*, May–June, 1895.

OREGON: *Leiberg* 4070, in 1899.

Orogenia fusiformis leibergi C. & R. Rev. N. Am. Umbell. 92. 1888.

A taller, more slender form, 3 dm. or more high, with petioles correspondingly elongated.

Type locality, "sandhills in the Bitterroot Mountains, Idaho;" collected by *Leiberg*, June, 1887; type in Herb. Coulter.

The type specimens are the only ones known.

This is not only a much taller plant than the species, but it blooms considerably later, and mature fruit may reveal characters which will compel a different reference.

13. HESPEROGENIA C. & R. Contr. Nat. Herb. 5: 203. 1899.

Sepals obsolete. Fruit flattened laterally, nearly orbicular or short-oblong, rounded at base and apex, glabrous. Carpel nearly terete in section, with equal, indistinct, filiform ribs and thin pericarp. Stylopodium none. Oil tubes 2 or 3 in the intervals. Seed face broad, slightly concave.

Low acaulescent plants, with leaves once or twice ternate and with broadish segments, umbel of few unequal rays without involucre and with one or two bractlets, and yellow flowers.

A monotypic genus, known as yet only from Mount Rainier, Washington.

This genus is nearest to *Museniopsis*, but differs especially in its broad seed face, which is never involute or deeply concave. In the seed face it approaches *Eulophus* and *Pimpinella*, but differs from both in not having a conical stylopodium, and from the former also in its yellow flowers.

1. **Hesperogenia stricklandi** C. & R. Contr. Nat. Herb. **5**: 203. pl. 27. 1899. PLATE I.

Root deep seated, somewhat tuberous thickened, crowned with a slender rootstock (?); leaves 3 or 4, all basal, without stipular bases, ternate or biternate; the segments lanceolate, acute, 12 mm. long, glabrous; petioles 3.8 to 5 cm. long; scape 7.5 to 10 cm. long, either naked or with a small bract-like leaf; rays 3 to 6, some of the sterile as well as the fertile ones short (4 mm. long), others 14 mm. long; fruit 2 mm. long, either sessile or on pedicels 4 mm. or less long; styles long, reflexed.

Type locality, "Mount Rainier, Washington;" collected by *O. D. Allen*, no. 278; type in U. S. Nat. Herb. First collected by Mr. Percy Stickland, at same station.

Mount Rainier, Washington.

Specimens examined:

WASHINGTON: Mount Rainier, altitude 2,000 meters, *Allen* 278, August 30, 1897, and September 6, 1898; grassy meadows on north side of same mountain, altitude 1,540 meters, *J. B. Flett*, August, 1897.

EXPLANATION OF PLATE I.—Fig. *1*, plant; *2*, fruit; *3*, cross section of carpel—figs. *1* and *2* enlarged.

14. MUSINEON Raf. Jour. Phys. 91: 71. 1820.

Musenium Nutt. in Torr. & Gray Fl. **1**: 642. 1840 (for full synonymy of genus and species, see Bot. Gaz. **20**: 258. 1895).

Calyx teeth prominent (in ours). Fruit ovate or ovate oblong, flattened laterally. Carpel flattened dorsally, with equal filiform ribs and thin pericarp with no distinct strengthening cells. Carpophore entire (in ours) or two-parted (Mexican form). Stylopodium depressed. Oil tubes usually 3 in the intervals, very unequal in size (middle one largest), 2 to 4 on the commissural side. Seed face broadly concave.

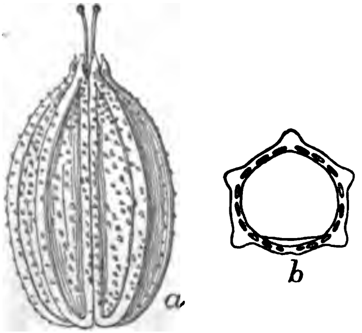
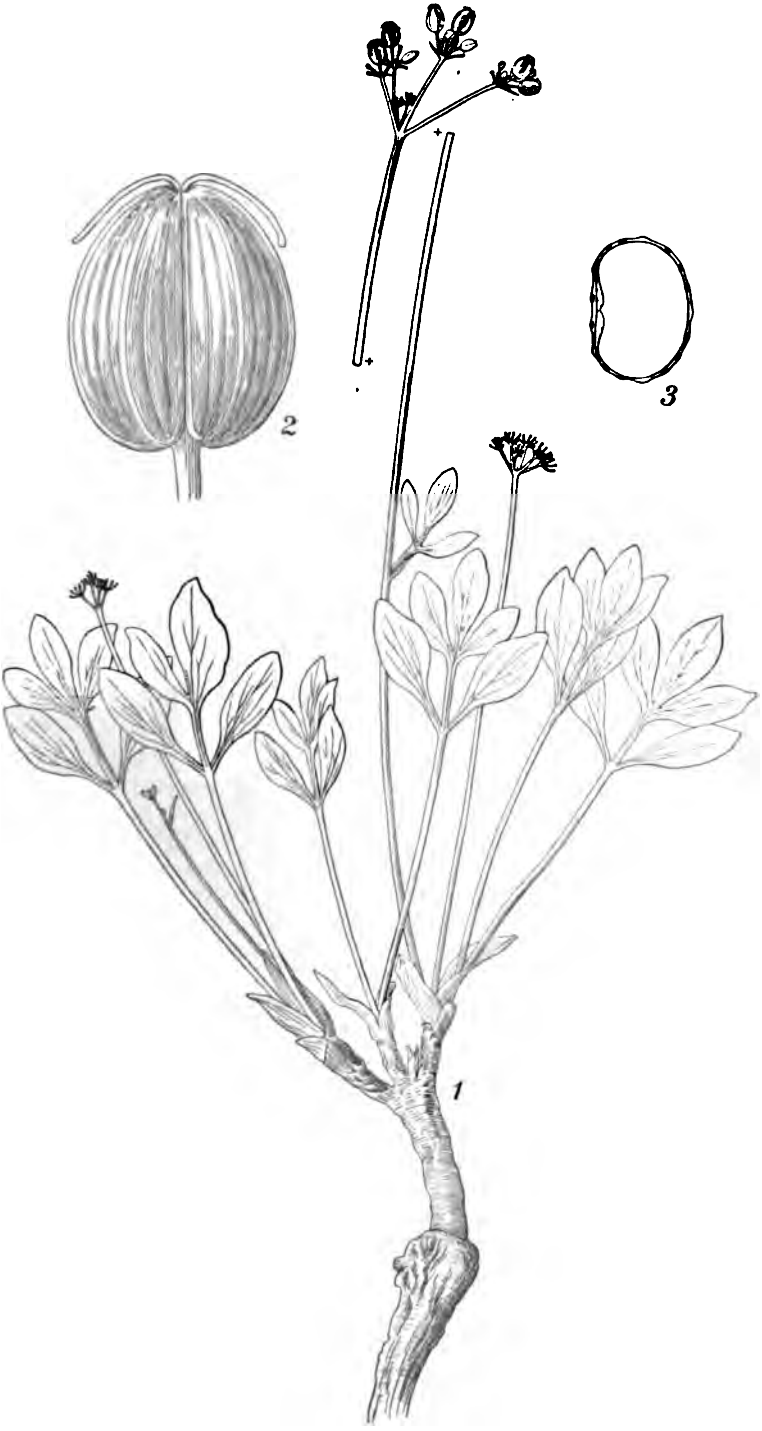


FIG. 13.—Musineon tenuifolium: *a*, ×8; *b*, ×10.

Glabrous or scabrous dwarf resiniferous dry-ground perennials, from thick elongated roots, acaulescent or dichotomously branching at base, with pinnately decompound leaves, no involucre, involucels of a few narrow bractlets and yellow flowers.



HESPEROGENIA STRICKLANDI C. & R.

Type species, *Seseli divaricatum* Pursh, Fl. **2**: 732. 1814.

A group of 4 species, three of which belong to western Canada and the United States as far south as Colorado, and one in the high mountains of southern Mexico.

Stems dichotomously branching from the base; leaf segments toothed.
  Stems glabrous; fruit smooth, about 4 mm. long.............. 1. *M. divaricatum.*
  Stems scabrous; fruit scabrous, shorter and broader than in the former.. 2. *M. hookeri.*
Acaulescent, the simple peduncles much exceeding the leaves; leaf segments narrowly linear and entire......................... 3. *M. tenuifolium.*

1. **Musineon divaricatum** (Pursh) C. & R. Bot. Gaz. **20**: 259. 1895.

Seseli divaricatum Pursh, Fl. **2** : 732. 1814.
Adorium lucidum Kuntze, Rev. Gen. Pl. **1**: 264. 1891.

Decumbent, glabrous; leaves bipinnatifid, with winged rachis; segments 3 to 5-toothed; peduncles 5 to 12.5 cm. long; umbel 10 to 25-rayed; rays 6 to 18 mm. long; pedicels short; fruit smooth, about 4 mm. long; oil tubes 3 in the intervals, with accessory ones beneath the ribs, 4 on the commissural side; seed terete, with rather deeply concave face.

Type locality, "in upper Louisiana;" collected by *Bradbury;* type in Herb. Philad. Acad.

From Alberta and Assiniboia to Montana, western Nebraska, and Colorado.

Specimens examined:

ALBERTA: Lethbridge, *Macoun* 4972, June 5, 1894.

ASSINIBOIA: Old Wives Creek, *Macoun* 10658, June 2, 1895.

MONTANA: Near Helena, *Kelsey* 263, in 1889; Great Falls, *Williams* 16, June 24, 1892.

WYOMING: Yellowstone Park, altitude 1860 meters, *Burglehaus*, June, 1893; Laramie County, *Nelson* 2875, May 14, 1897; Glen Creek, Yellowstone Park, *A. & E. Nelson* 5568, June 29, 1899.

NORTH DAKOTA: Fort Buford, *Havard*, May–June, 1889.

SOUTH DAKOTA: Black Hills, *Forwood*, in 1887; same region, altitude 1050 meters, *Rydberg* 719, June 23, 1892; Alkali Creek, *V. Bailey* 17, June 3, 1894.

NEBRASKA: Minden, Kearney County, *Hapeman.*

COLORADO: Near Denver, *Alice Eastwood*, in 1891; near Windsor, *Osterhout*, June, 1894 and 1895; near Denver, *Bethel*, in 1895 and 1898; near Fort Collins, *Baker* 6, May, 1896.

2. **Musineon hookeri** (Torr. & Gray) Nutt. in Torr. & Gray, Fl. **1**: 642. 1840.

Musenium divaricatum hookeri Torr. & Gray, Fl. **1** : 642. 1840.
M. trachyspermum Nutt. in Torr. & Gray, l. c.
M. angustifolium Nutt. in Torr. & Gray, l. c.

Resembling *M. divaricatum*, but more or less scabrous throughout; fruit scabrous, smaller, 2 to 3 mm. long, with more prominent ribs; oil tubes mostly solitary in the intervals, often with smaller accessory ones in the intervals or beneath the ribs, two on the commissural side; seed sulcate beneath the oil tubes, with more shallow concavity.

Type locality, "plains of the Upper Platte, near the Rocky Mountains;" collected by *Nuttall;* type in Herb. Philad. Acad.

From Assiniboia to Montana, Black Hills of South Dakota, and Colorado.

Specimens examined:

ASSINIBOIA: Moose Jaw, *Macoun* 10659, May 19, 1895.

MONTANA: Grasshopper Valley, *Watson* 154, July 23, 1880; near Helena, *Kelsey*, May 21, 1888; *Blankinship* 23, May 4, 1890; near Red Lodge, *Rose* 8, July 24, 1893; Pole Creek, *Rydberg* 4615, July 4, 1897.

WYOMING: *Alden;* Yellowstone Park, *Tweedy* 853, June, 1885; Laramie, *Nelson* 10, May 7, 1894.

SOUTH DAKOTA: Black Hills, *Forwood* 144, June 9, 1887.

COLORADO: *Hall & Harbour* 214, in 1862; plains, *Vasey*, in 1868; Apex, *Wolf* 726, in 1873; foothills, altitude 1,800 meters, *Cowen* 185, May 11, 1895.

3. **Musineon tenuifolium** Nutt. in Torr & Gray, Fl. 1: 642. 1840. FIG. 13.

Acaulescent, somewhat cespitose, glaucous; leaves tripinnatifid, with narrowly linear segments; peduncles much longer than the leaves, 1 to 2 dm. long; umbel 12 to 20-rayed; fruit nearly glabrous, 3 to 4 mm. long; oil tubes large, 2 or 3 in the intervals.

Type locality, "Rocky Mountains;" collected by *Nuttall;* type in Herb. Philad. Acad. and Herb. Columbia Univ.

Western Nebraska, western South Dakota, and Wyoming.

Specimens examined:

NEBRASKA: Dawes County, altitude 1,380 meters, *Bessey*, June 29, 1889; Sioux County, *Webber*, August 2, 1889; War Bonnet Canyon, altitude 1,560 meters, *Williams* 308, June 23, 1890; Cheyenne County, *Rydberg*, July 4, 1891; Scotts Bluff County, *Rydberg*, July 6, 1891.

SOUTH DAKOTA: Black Hills, *Forwood* 146, May 5, 1887; same region, altitude 1,050 to 2,100 meters, *Rydberg* 718, June 1892.

WYOMING: Laramie Hills, *Nelson* 176, June 7, 1894; Lusk, *Knowlton* 108, June 28, 1896; Laramie and Albany counties, *Nelson* 2878, 3168, in 1897.

4. **Musineon vaginatum** Rydberg, Mem. N. Y. Bot. Garden 1: 288. 1900.

"Stem less than 1 dm. high, from a thick perennial root, glabrous, striate, more or less purple-tinged, 2 to 3-leaved; basal leaves with petioles about 5 cm. long, twice or thrice ternate, with stalked divisions (stalk of the terminal one longest), glabrous; divisions divided into linear or linear-oblong obtuse segments about 5 mm. long; stem leaves similar, short petioled, and with a very conspicuous purple and scarious-margined sheath; umbel 1 to 2 cm. in diameter, with several rays; involucre none; involucels of linear bracts nearly as long as the pedicels; sepals evident; petals white or sometimes yellowish; mature fruit not seen; young fruit with strong angles, but no wings, a little compressed laterally; oil tubes apparently 3 in the intervals; seed face plane; stylopodium depressed."

Type locality, "Montana, Bridger Mountains;" collected by *Rydberg & Bessey*, no. 4626, June 15, 1897; type in Herb. Columbia Univ., duplicate in U. S. Nat. Herb.

Bridger Mountains, Montana.

Specimens examined:

MONTANA: Type specimens as cited under type locality; same station and date, *Rydberg & Bessey* 4625; *Flodman* 695, in 1897.

We quote the original description of this species, as the material does not permit us to determine the genus to which it belongs. Fruiting specimens of what appears to be this species were collected by Mr. Frank Tweedy in the Big Horn Mountains of Wyoming in 1899. The fruit is oblong, 3 mm. long, flattened laterally, the surface slightly roughened, and with no stylopodium.

15. **DEWEYA** Torr. & Gray, Fl. 1: 641. 1840.

Calyx teeth prominent. Fruit oblong, flattened laterally, glabrous. Carpel with 5 prominent very acute ribs. Stylopodium none. Carpophore divided. Oil tubes several in the intervals and on the commissural side. Seed nearly terete in section, the face deeply sulcate.

Caulescent plants, with simply pinnate leaves, mostly no involucre, involucels of few linear bractlets, and yellow flowers.

Type species, *Deweya arguta* Torr. & Gray.

A monotypic genus, so far as known, belonging to the mountains of southern California and Lower California.

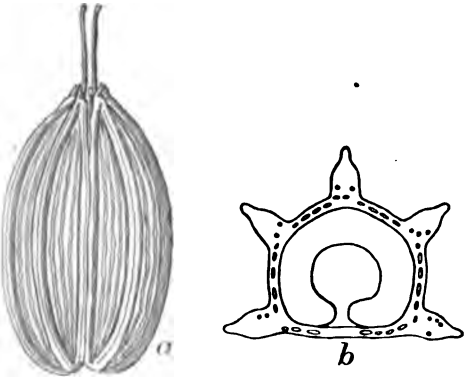


FIG. 14.—Deweya arguta: a, × 4; b, ×8.

The genus *Deweya* has been referred to *Velaea* and to *Arracacia*, which two genera are now merged under the latter name, but differs chiefly in its lack of stylopodium and pinnate leaves. Its relationship is nearest to *Tauschia*, from which it differs in its very sharp prominent ribs, prominent and persistent calyx teeth, as well as in its range. Drudé in Engler & Prantl's *Nat. Pflanzfam.* has associated *Deweya* with *Museniopsis* as subgenera under *Velaea*, but it is more clearly distinct from *Museniopsis* than from *Tauschia*. In our *Rev. N. Am. Umbell.* we were led to associate with *D. arguta* certain other species which had been described under the genus, and which had gradually come to stand for it. Accordingly *D. arguta* came to be regarded as an exceptional species, rather than the type of the genus. We have here maintained *Deweya* as at first established, and have separated from it the subsequently described species as representing a genus more distinct from *Deweya* than is *Deweya* from *Tauschia*.

1. **Deweya arguta** Torr. & Gray, Fl. 1: 641. 1840. FIG. 14.

Ligusticum argutum Nutt. in Torr. & Gray, Fl. 1: 641. 1840.
Arracacia arguta Watson, Bibl. Index 419. 1878.
Velaea arguta C. & R. Rev. N. Am. Umbell. 120. 1888.
V. arguta ternata C. & R. Bot. Gaz. 14: 282. 1889.

Glabrous, 3 to 7.5 dm. high, rarely acaulescent; leaves simply pinnate, petiolules of lowest pair of leaflets sometimes prominent enough to give a ternate appearance; leaflets 5 to 7, ovate, 2.5 to 7.5 cm. long, the lowest petiolulate and often subcordate, finely and sharply mucronate serrate, the terminal and lowest often 3-lobed; umbel 12 to 16-rayed, mostly with no involucre, and involucels of few linear acuminate bractlets; rays 5 to 9 cm. long; pedicels short, 3 to 10 mm. long; fruit oblong, smooth, 8 mm. long; oil tubes 3 to 5 in the intervals, 4 to 6 on the commissural side.

Type locality, "woods of San Diego, California;" collected by *Nuttall;* type in Philad. Acad.

Mountains of southern California and Lower California.

Specimens examined:

CALIFORNIA: San Bernardino, *G. R. Vasey* 226, May, 1880; Pasadena, *Jones* 3027, February, 1882; Los Angeles County, *Hasse*, March–April, 1886, 1888; San Diego County, *Orcutt*, July, 1889; Santa Monica, *Hasse*, May, 1892; San Isabel, *Henshaw*, April–May, 1893; San Bernardino, *Parish* 4470, June, 1897.

16. **DRUDEOPHYTUM** C. & R., gen. nov.

Calyx teeth evident or wanting. Fruit orbicular, flattened laterally, glabrous, or pubescent. Carpel with 5 slender filiform ribs. Stylopodium none. Carpophore variable. Oil tubes several in the intervals and on the commissural side. Seed nearly terete in section, the face with a narrow deep sulcus which enlarges into a central cavity.

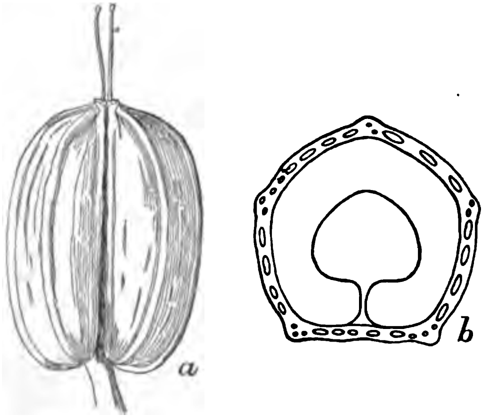


FIG. 15.—Drudeophytum hartwegi: *a*, ×4; *b*, ×8.

Caulescent or acaulescent plants, with ternately compound leaves (except in *D. vestitum*), mostly no involucre, more or less prominent involucels, and yellow flowers (except in *D. vestitum?*).

Type species, *Deweya hartwegi* Gray, Proc. Am. Acad. **7**: **342.** 1868.

A group of 6 species, belonging to the mountains of the Pacific slope, from southern California to central Oregon.

The species placed here under *Drudeophytum* have been heretofore associated with *Deweya arguta*, as mentioned in the discussion under that genus. *Drudeophytum* differs from *Deweya*, however, in having orbicular fruit, with slender filiform ribs and ternate leaves.

Glabrous or sometimes scabrous; leaves ternate; flowers yellow; sterile flowers without calyx teeth.

Calyx teeth obsolete.
Foliage more or less scabrous.
Involucels conspicuous; fruit large .... 1. *D. hartwegi.*
Involucels inconspicuous; fruit small .... 2. *D. kelloggii.*
Foliage glabrous and glaucous .... 3. *D. glaucum.*
Calyx teeth evident.
Umbels large and open; southern California .... 4. *D. parishii.*
Umbels contracted; mountains of Oregon .... 5. *D. howellii.*
Densely clothed with soft pubescence; leaves pinnate; flowers white; sterile flowers on long pedicels, and with prominent persistent calyx teeth. 6. *D. vestitum.*

1. **Drudeophytum hartwegi** (Gray) C. & R. FIG. 15.

Deweya hartwegi Gray, Proc. Am. Acad. **7** : 342. 1867.
Arracacia hartwegi Watson, Proc. Am. Acad. **22** : 415. 1887.
Velaea hartwegi C. & R. Rev. N. Am. Umbell. 121. 1888.

Mostly acaulescent, 3 to 6 dm. high, minutely scabrous throughout; leaves biternate and quinate (ultimate segments more or less confluent); leaflets ovate, 2.5 to 5 cm. long, acute at base, coarsely and deeply mucronate-serrate and lobed; umbel 16 to 20-rayed, mostly with no involucre, and involucels of prominent foliaceous linear oblong reflexed bractlets on one side of the umbellets; rays 6 to 10 cm. long; pedicels short, 1 to 7 mm. long; fruit nearly orbicular, smooth, 6 to 8 mm. long, 5 to 6 mm. broad; carpophore entire; oil tubes 3 in the dorsal intervals, 5 or 6 in the laterals, 8 to 10 on the commissural side.

Type locality, "on the Sacramento," California; collected by *Hartweg*, no. 1748; type in Herb. Gray.

California.

Specimens examined:

CALIFORNIA: San Luis Obispo, *Jones* 3238, May 6, 1882; near Fort Tejon, Kern County, altitude 1,000 meters, *Coville & Funston* 1157, July 2, 1891; Amador County, *Hansen* 900, April 6, 1893; Little Chico Canyon, Butte County, *Mrs. Austin* 866, March–June, 1896; Mount Diablo, *Alice Eastwood*, May 31, 1897; Morrison Canyon, Niles, *Jepson*, June 19–20, 1897.

2. **Drudeophytum kelloggii** (Gray) C. & R.

Deweya kelloggii Gray, Proc. Am. Acad. **7**: 343. 1867.
Arracacia kelloggii Watson, Proc. Am. Acad. **22**: 415. 1887.
Velaea kelloggii C. & R. Rev. N. Am. Umbell. 121. 1888.

Acaulescent, or nearly so, mostly puberulent, more slender, 3 to 6 dm. high; leaves triternate; leaflets ovate, 1 to 3.5 cm. long, mostly 3-lobed; umbel 8 to 16-rayed, mostly with no involucre, and involucels of small linear bractlets; rays 2.5 to 7.5 cm. long; pedicels 6 to 8 mm. long; fruit 2 to 4 mm. long, almost as broad, somewhat notched at base; otherwise like *D. hartwegi.*

Type locality, "Bolinas Bay, near San Francisco;" collected by *Kellogg*, June 23; type in Herb. Gray.

California and Oregon.

Specimens examined:

CALIFORNIA: Oakland Hills, near San Francisco, *Kellogg & Harford*, in 1868; same station, *Kellogg*, June, 1870; Crystal Springs, *G. R. Vasey*, in 1875; Folsom, *Katharine Curran*, May, 1883; summit of Mount Tamalpais, *Katharine Curran*, July 4, 1886; Kaweah, Tulare County, *Alice Eastwood*, May, 1894; Sequoia Mills, Fresno County, *Alice Eastwood*, May, 1894; Mount Tamalpais, Marin County, *Alice Eastwood*, in 1894 and 1896.

OREGON: Waldo, *Howell*, May 30, 1884.

3. **Drudeophytum glaucum** C. & R. PLATE II.

Velaea glauca C. & R. Contr. Nat. Herb. **3**: 321. pl. 14. 1895.

Short caulescent, slender, 4.5 dm. or less high, erect or somewhat spreading, glabrous and somewhat glaucous; basal leaves small, twice or thrice ternate; stem leaves often simply ternate; leaflets small, 12 mm. or less long, mostly cordate or truncate at base, often 3-lobed or 3-parted, irregularly toothed; umbel 7 to 15-rayed, with no involucre, and involucels of small linear bractlets; rays 2.5 to 5 cm. long; pedicels 2 mm. or less long; fruit orbicular, 2 mm. in diameter; carpophore parted below the middle.

Type locality, "Glendale," Oregon; collected by *Howell*, April 30, 1887; type in U. S. Nat. Herb.

Southern Oregon.

Specimens examined:

OREGON: Canyonville, *Howell*, April, 1881; Glendale, *Howell*, April 30, 1887.

EXPLANATION OF PLATE II.—Fig. *a*, umbel; *b*, fruit.

4. **Drudeophytum parishii** C. & R.

Velaea parishii C. & R. Rev. N. Am. Umbell. 121. 1888.

Glabrous throughout, nearly acaulescent, 3 to 4 dm. high; leaves thickish, ternate-pinnatifid, the segments ovate, irregularly cuspidate-toothed and lobed; umbel about 20-rayed, with no involucre, and involucels of few setaceous bractlets; rays 5 to 7.5 cm. long; pedicels about 4 to 7 mm. long; calyx teeth prominent; fruit oblong, glabrous, 6 to 7 mm. long; carpophore 2-parted; oil tubes 3 or 4 in the intervals, 4 or 5 on the commissural side.

Type locality, north side of "San Bernardino Mountains," California; collected by *Parish Bros.*, no. 1827, June, 1886; type in Herb. Coulter.

Southern California.

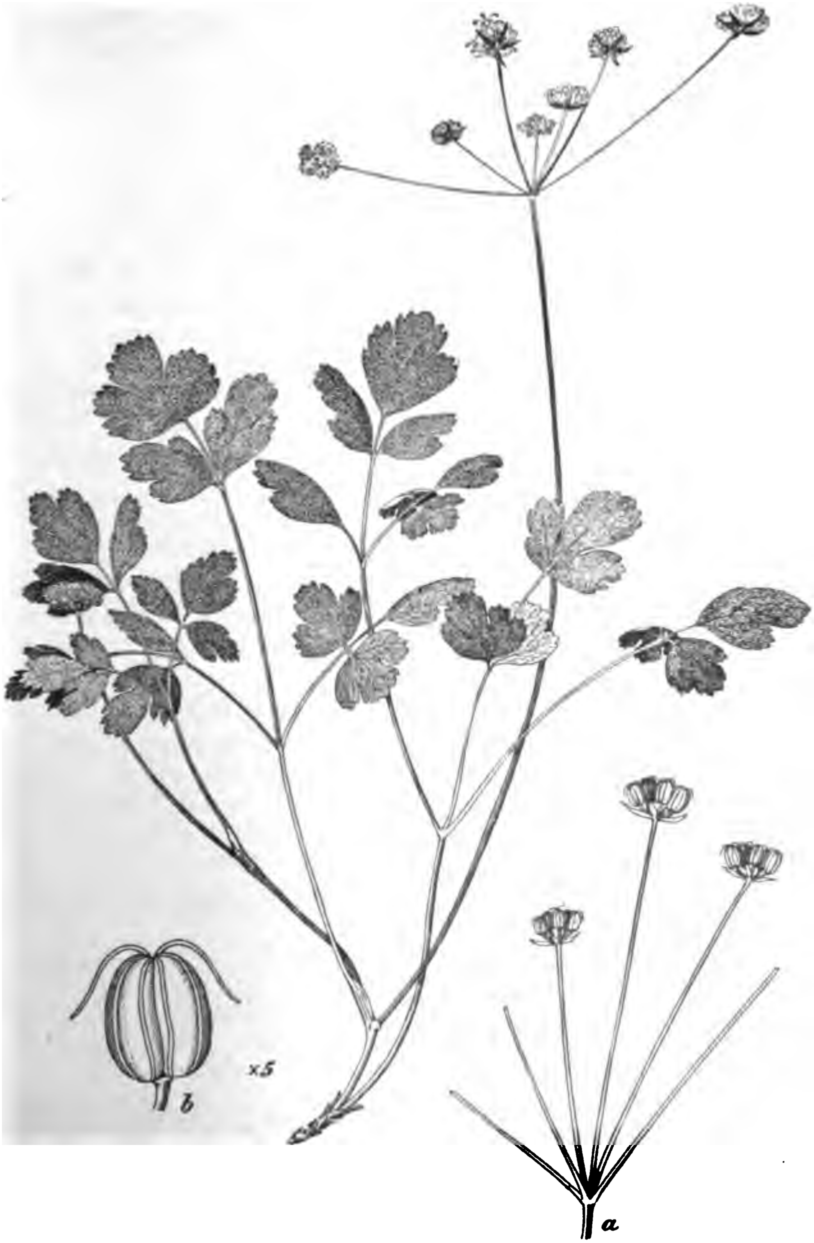
Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; Long Meadow, Tulare County, *Palmer* 169, July 7–14, 1888; near Tejon Pass, Kern County, *Coville & Funston* 1222, July 12, 1891; San Jacinto Mountains, San Diego County, altitude 1,800 meters, *Hasse*, July, 1892; Wilsons Peak, Los Angeles County, *Davidson*, July, 1892; San Bernardino Mountains, altitude 1,500 to 1,950 meters, *Parish* 3006, 3504, June, 1894.

5. **Drudeophytum howellii** C. & R.

Velaea howellii C. & R. Rev. N. Am. Umbell. 122. 1888.

Glabrous throughout, short caulescent, 5 to 7.5 cm. high; leaves 1



DRUDEOPHYTUM GLAUCUM C. & R.

or 2, thickish, 3 to 4 cm. long, with ovate outline; the oblong segments with irregular teeth and lobes, which are pungently tipped, and revolute margins; umbel 3 to 6-rayed (sometimes with 1 or 2 sessile umbellets), with no involucre, and involucels exceedingly prominent, being exactly like the leaves and forming the principal part of the foliage of the plant; rays 10 to 16 mm. long; pedicels about 2 mm. long; calyx teeth prominent; fruit (immature) oblong, glabrous, 2 mm. long; oil tubes several in the intervals.

Type locality, "top of Siskiyou Mountains, Oregon;" collected by *Howell*, no. 711, July 20, 1887; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Alpine summits of Siskiyou Mountains, Oregon.

Specimens examined:

OREGON: Siskiyou Mountains, near Ashland, *Howell* 1366, July 19–20, 1887.

A very rare and restricted species, which does not seem to have been found since the original collection.

6. **Drudeophytum vestitum** (Watson) C. & R.

Deweya vestita Watson, Proc. Am. Acad. **17**: 374. 1882.
Arracacia vestita Watson, l. c. **22**: 415. 1887.
Velaea vestita C. & R. Rev. N. Am. Umbell. 122. 1888.

Acaulescent, 5 to 10 cm. high, densely clothed throughout with white soft spreading hairs; leaves pinnately compound, with numerous crowded confluent oblong segments; umbel 10 to 15-rayed, with no involucre, and involucels of numerous lanceolate bractlets; rays 8 to 16 mm. long; fruit sessile or nearly so, the sterile pedicels 12 to 18 mm. long; fruit ovate-oblong, pubescence 4 to 5 mm. long, 2 mm. broad; oil tubes 3 or 4 in the intervals, 3 on the commissural side.

Type locality, "summit of Mount Baldy, near San Bernardino," California; collected by *Parish Bros.*, August, 1880; type in Herb. Gray.

Mountains of southern California.

Specimens examined:

CALIFORNIA: Bear Valley, altitude 1,500 meters, *Parish* 1825, June, 1886; Long Meadow, Tulare County, altitude 2,400 to 2,700 meters, *Palmer* 193, June 7–14, 1888; near Whitney Meadows, altitude 2,850 meters, *Coville & Funston* 1628, August 20, 1891; Mount Whitney, altitude 3,300 to 3,900 meters, *Katharine Brandegee* 1479.

17. **MUSENIOPSIS** C. & R. Rev. N. Am. Umbell. 26 and 123. 1888.

Calyx teeth obsolete. Fruit flattened laterally, oblong, glabrous. Carpel somewhat flattened laterally, with equal filiform ribs (the intermediates somewhat distant from the laterals), and a thin pericarp with ill-defined strengthening cells beneath the ribs. Oil tubes 3 or 4 in the intervals, 4 on the commissural side. Seed terete, the face with a deep and narrow sulcus.

Glabrous perennials from thick elongated roots, with basal pinnate leaves, no involucre, involucels of few small bractlets, and yellow flowers (in ours).

Type species, *Tauschia texana* Gray.

A Mexican genus of about 20 species, one of which reaches Texas.

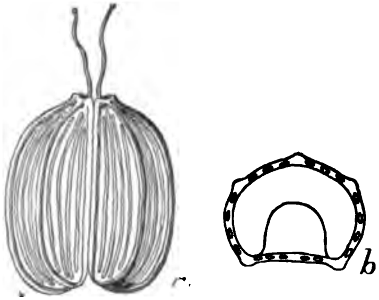


FIG. 16.—Museniopsis texana: *a*, *b*, × 8.

1. **Museniopsis texana** (Gray) C. & R., Rev. N. Am. Umbell. 123. 1888. FIG. 16.

Tauschia texana Gray, Bost. Jour. Nat. Hist. **6**: 211. 1850 (Pl. Lindh.).
Eulophus texanus Benth. & Hook. Gen. Pl. **1**: 885. 1867.
Velaea texana Drude in Engler & Prantl. Nat. Pflanzenfam. **3**^{8}: 169. 1898.

Acaulescent; scape 5 to 20 cm. high, longer than the leaves, somewhat scabrous at base of umbels; leaves 5 to 7-pinnate; lower pinnæ petiolate, pinnately parted; segments cuneiform, 3 to 5-cleft; umbel 5 to 8-rayed; fruit 3 mm. long.

Type locality, "western Texas, near Austin?;" collected by *Wright;* type in Herb. Gray.

Texas, and extending into Mexico.

Specimens examined:

TEXAS: Industry, *Wurzlow*, May, 1895.

18. BUPLEURUM L. Sp. Pl. 1: 236. 1753.

Calyx teeth obsolete. Fruit oblong, flattened laterally, with rather broad commissure. Carpel with equal very slender or prominent ribs, each with a very small group of strengthening cells. Stylopodium prominent and flat. Oil tubes wanting, or continuous about the seed cavity. Seed face plane or somewhat concave.

Annuals or perennials, with simple entire clasping or perfoliate stem leaves, with or without an involucre, involucels of 5 or more ovate bractlets, and yellow flowers.

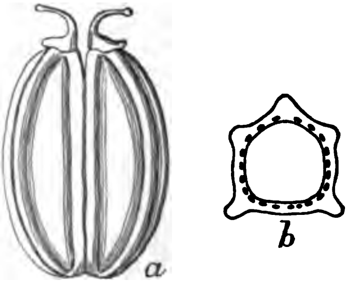


FIG. 17.—Bupleurum americanum: *a*, × 8; *b*, × 12.

First species cited, *B. rotundifolium* L.

A group of 60 or more species, all but one belonging to the Old World.

The genus includes species of very diverse characters, and the description given above applies only to those included in our flora.

Perennial, from a branching caudex; involucre of 3 to 5 unequal bracts; involucels of 5 to 8 rather small ovate bractlets; carpel with prominent ribs; oil tubes continuous about the seed cavity, and one in each rib; seed face plane.
1. *B. americanum.*

Annual; involucre none; involucels of 5 very conspicuous ovate mucronate bractlets; carpels with very slender ribs and no oil tubes; seed face somewhat concave (see p. 252) .... *B. rotundifolium.*

1. **Bupleurum americanum** C. & R. Rev. N. Am. Umbell. 115. 1888. Fig. 17.

Basal leaves linear-lanceolate; cauline ones very variable, oblong to linear, more or less clasping; rays unequal, 1.5 to 5 cm. long; pedicels short.

From Alaska to Montana, Idaho, and Wyoming.

Specimens examined:

Alaska: Fort St. Michael, Norton Sound, *Bannister*, in 1865–66; same station, *Turner* 8, August 14, 1879; Herald Island, *Captain Hooper*, in 1881; above Fort Yukon, *Bates*, in 1881; *Funston* 147, in 1893; Yukon region, *Williams*, in 1899; Yakutat Bay, *Saunders* 4114, July 12, 1899.

Alberta: Waterton Lake, *Macoun* 10670, July 28–31, 1895.

Montana: Valley of Musselshell River, *Canby*, August 19, 1882; Belt Mountains, *Anderson*, September, 1889; same station, *Williams* 197, September 7, 1890; near Red Lodge, *Rose* 46, July 27, 1893; Beartooth Mountains, above timber line, *V. Bailey* 37, August 13, 1894; near Geyser, Cascade County, *Ward* 140, August 27, 1895; Spanish Basin, Madison Range, altitude 1,800 meters, *Flodman* 682, July 11, 1896; Little Belt Mountains, altitude 1,800 meters, *Flodman* 683, 684, August 16–18, 1896.

Idaho: Mountains at head of Redfish Lake, altitude 2,550 to 3,000 meters, *Evermann* 446, August 22, 1895.

Wyoming: *Coulter*, in 1872; Green River, *Richardson*, in 1878; mountains of Yellowstone Park, *Knowlton*, August 15, 1887; *Evermann*, in 1893; north-western Wyoming, *Rose* 341, September 6, 1893; Teton Mountains, *Nelson* 972, August 21, 1894; Union Pass, *Nelson* 893, August 14, 1894; Electric Peak, Yellowstone Park, *Rydberg* 4600, August 18, 1897.

For introduced species, see page 252.

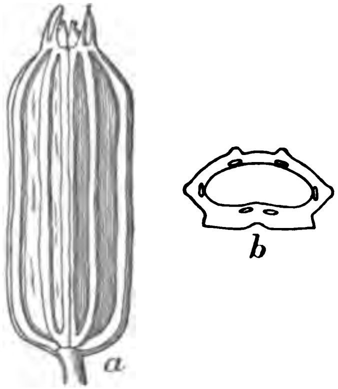


Fig. 18.—Trepocarpus aethusae: *a*, × 12; *b*, × 10.

19. TREPOCARPUS Nutt. in DC. Coll. Mém. 5: 56. 1829.

Calyx teeth prominent, unequal. Fruit linear-oblong, flattened laterally, smooth. Carpel somewhat dorsally flattened, with no primary ribs, 4 prominent corky secondary ribs, and a broad conspicuous band of strengthening cells about the seed cavity, making a thick crustaceous pericarp. Stylopodium conical, with very short style. Oil tubes solitary beneath the secondary ribs, more or less imbedded in the seed and adhering to it, 2 on the commissural side. Seed face plane or somewhat concave.

Glabrous annuals, with thin pinnately decompound leaves and linear segments, lateral few-rayed umbels opposite the leaves, involucre and involucels of few linear entire or divided bracts, and white flowers.

A monotypic genus belonging to the southern prairie region of the United States.

1. **Trepocarpus aethusae** Nutt. in DC. Coll. Mém. **5**: 56. pl. 14. 1829.
FIG. 18.

From 1 to 9 dm. high; umbels 2 to 5-rayed; umbellets few-flowered, with very short pedicels; fruit 8 to 10 mm. long.

Type locality, "territoire d'Arkansa"; collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Philad. Acad.

Prairies of Arkansas and Indian Territory to Alabama and Texas.

Specimens examined:

ARKANSAS: Fort Smith, *Bigelow*, in 1853–54; near Little Rock, *Coville* 25, July 8, 1887; same station, *Mrs. Taft*, in 1888.

INDIAN TERRITORY: Sans Bois Mountains, *Sheldon* 101, July 6, 1891.

ALABAMA: Near Mobile, *Mohr.*

MISSISSIPPI: Starkville, *Phares*, May, 1883.

TEXAS: Hempstead, *Hall* 258, June 10, 1872; near Dallas, *Reverchon*, June, 1879, 1880, and 1881; *Thurow*, in 1889.

20. APIUM L. Sp. Pl. 1: 264. 1753.

Calyx teeth obsolete. Fruit flattened laterally, ovate or broader than long, glabrous. Carpel with prominent obtuse nearly equal corky ribs and no strengthening cells. Stylopodium wanting or depressed. Oil tubes solitary in the intervals, 2 on the commissural side. Seed section round.

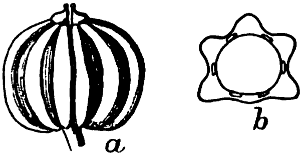


FIG. 19.—Apium ammi: a, × 10; b, × 12.

Erect or prostrate glabrous herbs with pinnately or ternately divided leaves and umbels of white flowers opposite the leaves.

First species cited is *A. petroselinum* L., which is a *Petroselinum;* the second species cited is *A. graveolens* L.

A group of about 20 species chiefly dispersed through the Eastern Hemisphere and represented in our native flora by a single widely distributed species.

1. **Apium ammi** (L.) Urban, Fl. Bras. **11**^{1}: 341. pl. 91. 1879.
FIG. 19.

Sison ammi L. Sp. Pl. **1**: 252. 1753; Jacq. Hort. Vindob. **2**: 95. pl. 200. 1772.
A. leptophyllum F. Muell. in Benth. Fl. Austral. **3**: 372. 1866.

From 1 to 6 dm. high; leaves ternately divided into filiform segments; umbels sessile or short pedunculate; fruit 2 mm. long.

Type locality, "in Apulia, Ægypto."

In wet ground from North Carolina to Florida, westward to Texas and California; also extending into Mexico and South America.

Specimens examined:

SOUTH CAROLINA: Columbia, *Katherine Taylor.*
FLORIDA: East Florida, *Palmer* 196, in 1874; near Jacksonville, *Curtiss*, in 1875 and 1894.
TEXAS: Near Houston, *Hall* 245, 246, April 18, 1872; near Dallas, *Reverchon* 369, May, 1877; near Eagle Pass, *Havard*, May, 1883; Travis County, *Bodin*, September, 1891; Nueces County, *Heller* 1472, March 21, 1894.
CALIFORNIA: *Douglas*, in 1833.

In his publication of the combination *Apium ammi*, Urban referred the original *Sison ammi* to Jacquin, as though it might not be the same as *Sison ammi* of Linnaeus. This expression of doubt has led to the use of the second tenable specific name, *Apium leptophyllum* F. Muell. Upon examining the publication of Jacquin we discover that he had no doubt that he was dealing with the *Sison ammi* of Linnaeus, and cites several of the Linnaean references, both from Europe and Africa. The plant was figured by Shaw as early as 1738, and both Linnaeus and Jacquin cite Shaw's plate. There seems to be no reasonable doubt that Jacquin knew and used the *Sison ammi* of Linnaeus.

For introduced species, see page 253.

21. **SPERMOLEPIS** Raf. Neog. 2. 1825.

Leptocaulis Nutt. in DC. Coll. Mém. 5: 39. 1829.

Calyx teeth obsolete. Fruit ovate, flattened laterally, bristly or tuberculate. Carpel with somewhat prominent or obsolete ribs, thickish pericarp, and prominent groups of strengthening cells. Stylopodium conical, somewhat prominent. Oil tubes solitary in the intervals, 2 on the commissural side. Seed face plane.

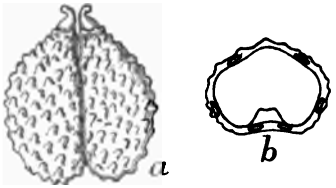


FIG. 20.—Spermolepis divaricatus: a, b, × 12.

Very slender smooth branching annuals, with finely dissected leaves having filiform or linear segments, and small flowers in involucellate very unequally few-rayed pedunculate umbels.

Type species, *Daucus divaricatus* Walt. Fl. Car. 114. 1788.

A genus of 2 species, belonging to the southern United States, from North Carolina and Florida to southern California, and extending into Mexico.

This genus is referred to *Apium* by Bentham & Hooker, who are followed by Drude in Engler & Prantl's *Nat. Pflanzenfamilien*, but in our judgment it deserves to remain as a distinct genus.

Fruit tuberculate .... 1. *S. divaricatus.*
Fruit with hooked bristles .... 2. *S. echinatus.*

1. **Spermolepis divaricatus** (Walter) Britton, Mem. Torr. Bot. Club 5: 244. 1894. FIG. 20.

Daucus divaricatus Walt. Fl. Car. 114. 1788.
Leptocaulis divaricatus DC. Coll. Mém. 5: 39. pl. 10, fig. a. 1829.
Leptocaulis diffusus Nutt. in DC. l. c.
Apium divaricatum Wood, Bot. & Flor. 140. 1870.

Why not cite the type a [illegible] by Raf. [illegible]

With spreading branches, 3 to 6 dm. high; umbels more diffuse than in *S. echinatus*, and usually with fewer rays; fruit tuberculate, about 1 mm. long, with rather broad commissure and somewhat prominent ribs.

Type locality not given, but presumably in the Carolinas.

North Carolina to Florida, west to Texas and Kansas.

Specimens examined:

FLORIDA: *Chapman;* Hibernia, *Canby*, March, 1869; near Jacksonville, *Curtiss*, in 1875; Cedar Keys, *Garber*, April, 1876; East Florida, *Mary C. Reynolds*, April, 1876; Duval County, *Fredholm*, March 30, 1893; near Jacksonville, *Curtiss* 4338, 4609, April, 1893 and 1894; Eustis, Lake County, *Nash* 392, April 1–15, 1894.

MISSISSIPPI: Ocean Springs, *Tracy*, April 10, 1890.

ARKANSAS: Fort Smith, *Bigelow*, in 1853–54.

KANSAS: Manhattan, Riley County, *Kellerman.*

INDIAN TERRITORY: Sapulpa, *Bush* 185, June 19, 1894.

OKLAHOMA: *Waugh* 199.

TEXAS: Houston, *Hall* 249, April 18, 1872; Dallas, *Reverchon* 367, 370, May, 1879 and 1880; Tom Green County, *Tweedy*. May, 1880; Kerr County, *Heller* 1773, May 14–21, 1894; Industry, *Wurzlow*, in 1895.

NEW MEXICO: Las Vegas, *Dewey*, June 24, 1891.

2. **Spermolepis echinatus** (Nutt.) Heller, Contr. Herb. Franklin & Marshall Coll. 1: 3. 1895.

Leptocaulis echinatus Nutt. in DC. Prodr. 4: 107. 1830.
Apium echinatum Watson, Bibl. Index 412. 1878.

Lower, 1 to 3 dm. high, and not so diffuse; fruit echinate with spreading hooked bristles with swollen tuberculate bases, about 1 mm. long, with rather narrow commissure and obsolete ribs.

Type locality, "Red River" [Arkansas]; collected by *Nuttall;* type (or duplicate) in Herb. Philad. Acad.

From Alabama to southern California, and extending into Mexico.

Specimens examined:

MISSISSIPPI: Petit Bois Island, *Tracy* 4926, May 8, 1898.

INDIAN TERRITORY: *Palmer* 148*a*, in 1868; Sapulpa, *Bush* 188, June 19, 1894.

TEXAS: Western Texas, *Wright* 1384, in 1852; Austin, *Hall* 251, May 17, 1872; Dallas, *Reverchon* 368, April, 1879 and 1881; Gillespie County, *Jermy* 142; Nueces County, *Heller* 1520, 1561, April 3–12, 1894.

NEW MEXICO: Carrizallilo Mountains, *Mearns* 37, April 20, 1892.

ARIZONA: Tucson, *Toumey* 195, March 26, 1892.

CALIFORNIA: Oakland Hills, *Lemmon*, in 1889.

For *Leptocaulis inermis* Nutt. see under *Apiastrum.*

22. **AMMOSELINUM** Torr. & Gray Pacif. R. Rep. 2^4: 165. 1855.

Calyx teeth obsolete. Fruit flattened laterally, ovate to ovate-oblong. Carpel with prominent equal more or less scabrous ribs; laterals closely contiguous to those of the other carpel, forming apparently a single broad rib; pericarp exceedingly hard, composed almost entirely of strengthening cells. Styles very short. Oil tubes solitary in the intervals, 2 on the commissural side; all rather small and not close to the seed cavity. Seed dorsally flattened, with plane face.

Low diffuse annuals, with ternately divided leaves, the small ultimate segments linear to spatulate, involucre and involucels of entire or dissected bracts, and white flowers in small sessile or short pedunculate unequal umbels.

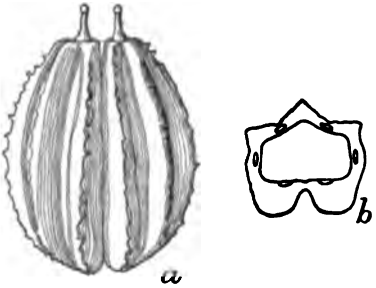


FIG. 21.—Ammoselinum popei: a, × 8; b, × 10.

Type species, *A. popei* T. & G.

A genus of two species, largely restricted to Texas, but extending into western Kansas, Arizona, and Mexico.

Rough scabrous; fruit ovate-oblong, 4 to 5 mm. long.
  Low, 1 dm. high .... 1. *A. popei.*
  Taller, 2 to 3 dm. high .. 2. *A. giganteum.*
Nearly glabrous; fruit ovate, 2 mm. long .... 3. *A. butleri.*

1. **Ammoselinum popei** Torr. & Gray, Pacif. R. Rep. 2^4: 165. 1855. FIG. 21.

Apium popei Gray, Proc. Am. Acad. 7: 343. 1867.

About 1 dm. high, with stem-angles, rays, pedicels, and ribs of fruit rough scabrous; leaf segments narrowly linear; fruit ovate-oblong, 4 to 5 mm. long, with thick corky commissure.

Type locality, "sandy soil, Llano Estacado and head waters of the Colorado;" collected by *Diffendorfer*; type in Herb. Gray.

In sandy soil, western Kansas to Texas, and extending into Mexico.

Specimens examined:

KANSAS: Southwestern Kansas, *Plank*.

TEXAS: Tom Green County, *Tweedy* 188, May, 1880; Brown County, *Reverchon* 1402, April, 1882; San Diego, *Mary B. Croft* 81, in 1884; Nueces County, *Heller* 1474, March 21, 1894.

2. **Ammoselinum giganteum** C. & R., sp. nov.

Much branched throughout and spreading, the branches 2 to 3 dm. long, angled and roughened; fruit ovate, 5 mm. long, with rather thin commissure, densely and sharply scabrous.

Type locality, mesas near Phœnix, Ariz.; collected by *C. G. Pringle*, no. 28, June 17, 1882; type in Herb. Gray.

Only known from type locality.

Specimens examined:

ARIZONA: Type specimens as cited under type locality.

Here perhaps belong specimens collected in the desert around Maricopa, Ariz., by L. H. Dewey, in June, 1894, except that the fruit is narrowly oblong and smaller. The material is rather fragmentary and should be collected in quantity by collectors in that region.

3. **Ammoselinum butleri** (Engelm.) C. & R. Bot. Gaz. **12**: 294. 1887.

Apium butleri Engelm. Proc. Am. Acad. **21**: 453. 1886.

Resembling *A. popei*, but smaller and nearly glabrous; leaf-segments narrowly oblong or spatulate; fruit ovate, about 2 mm. long, with ribs smooth or minutely scabrous, and corky commissure much less prominent.

Type locality, "Texas, in wet grounds near Houston"; collected by *Hall*, no. 244, March, 1872; type (or duplicate) in Herb. Gray. The type here given is the first specimen cited. Associated with it in the original description are *Reverchon*, near Dallas, Tex., and *Butler* in Indian Territory, south of the Arkansas.

In wet ground, Texas and adjacent Indian Territory.

Specimens examined:

TEXAS: Near Houston, *Hall* 244, March 20, 1872; near Harrisburg, *Joor* 122, March 16, 1876; near Dallas, *Reverchon* 366, March, 1878 and 1880; *Nealley*, in 1888; Hockley, Harris County, *Thurow*, March 23, 1889; near Galveston, *Bodin*, March 3, 1890; near Industry, *Wurzlow*, May, 1895; near Houston, *Rose* 4179, May 6, 1899.

23. **ZIZIA** Koch, Nov. Act. Caes. Leop. Acad. **12**: 128. 1824.

Calyx teeth prominent. Fruit flattened laterally, ovate to oblong, glabrous. Carpel with filiform ribs. Stylopodium wanting; styles long. Oil tubes large and solitary in the broad intervals, 2 on the commissural side, and a small one in each rib. Seed terete, sulcate beneath the oil tubes.

Smooth perennials (3 to 9 dm. high) of open prairies and upland meadows, with simple to ternately compound leaves, no involucre, involucels of small bractlets, yellow flowers, and central fruit of each umbellet sessile.

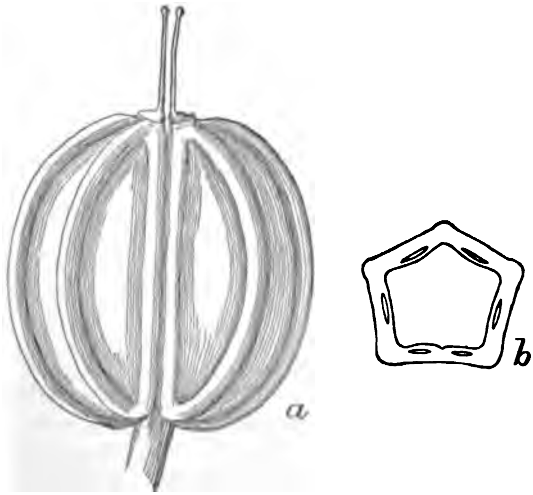


FIG. 22.—Zizia cordata: *a*, *b*, × 10.

Type species, *Smyrnium aureum* L.

A group of 3 species, belonging to the United States and Canada.

Basal leaves ternately divided.
  Stout plants with leaflets sharply serrate.................................1. *Z. aurea*
  Slender plants with leaflets coarsely serrate or toothed..................2. *Z. bebbii*
Basal leaves simple...3. *Z. cordata*

1. **Zizia aurea** (L.) Koch, Nov. Act. Caes. Leop. Acad. **12**: 129. 1824.

Smyrnium aureum L. Sp. Pl. **1**: 262. 1753.
Thaspium aureum apterum Gray, Man. ed. 2. 156. 1856.

Basal leaves very long-petioled, all but the uppermost leaves 2 to 3-ternate; leaflets ovate to lanceolate, sharply serrate; rays 15 to 25, stout, 2.5 to 5 cm. long; fruit oblong, about 4 mm. long.

Type locality, in "America borealis."

Throughout Canada and the Atlantic States, and extending west to Montana and eastern Texas.

Specimens examined: We cite but few of the numerous specimens examined.

MAINE: Aroostook County, *Fernald* 50, July 26, 1893.
VERMONT: Peacham, *Alice F. Stevens*, in 1892.
MASSACHUSETTS: Ipswich, *Oakes*.
CONNECTICUT: Fairfield, *Eames*, May 17, 1895.
NEW JERSEY: Passaic County, *Nash*, May–June, 1890.
DISTRICT OF COLUMBIA: High Island, *Pollard* 464, June 28, 1895.
VIRGINIA: Near Alexandria, *Ward*, May–June, 1878.
PENNSYLVANIA: Near Gap, *Small*, June 14,1889.
NEW YORK: Oxford, *Coville*, June 23, 1887.
ILLINOIS: Near Chicago, *Babcock;* Naperville, *Umbach*, May 26, 1898.
MISSOURI: Eagle Rock, *Bush* 187, June 21, 1897; Atherton, *Bush*, June 27, 1898.
ARKANSAS: Fort Smith, *Bigelow*, in 1853–54.
INDIAN TERRITORY: Chickasaw Creek, *Sheldon* 73, June 26, 1891.
TEXAS: Near Dallas, *Hall* 252, June 28, 1872.
MINNESOTA: Near Minneapolis, *Sandberg* 269, June, 1891; Fort Snelling, *Mearns*, May 19, 1891.
NEBRASKA: Ponca, *Clements* 2567, June 16, 1893.
SOUTH DAKOTA: *Duffy* 78, in 1887.
MONTANA: Arrow Creek, *Williams*, September, 1886.

The following variety appeared while we were reading proof:

Zizia aurea obtusifolia C. H. Bissell, Rhodora, **2**: 255. 1900.

2. **Zizia bebbii** (C. & R.) Britton, Mem. Torr. Club **2** : 35. 1890.

Z. aurea bebbii C. & R. Bot. Gaz. **12** : 138. 1887.

Resembling *Z. aurea*, but more slender; basal leaves on slender and shorter petioles, twice to thrice ternate; leaflets broadly ovate to oblong, mostly obtuse, more coarsely serrate or even toothed; rays 2 to 8, slender, 5 to 10 cm. long; fruit mostly smaller, oval, 2 to 3 mm. long.

Type locality, "Virginia and North Carolina;" collected by *Canby*, August, 1876; type in Herb. Coulter.

From the mountains of Virginia and West Virginia to Tennessee and Georgia.

Specimens examined:

VIRGINIA: Salt Pond Mountain, *Canby*, August, 1890; Roanoke River, *Small & Heller* 218, June 2, 1891; Smyth County, altitude 600 meters, *Small*, June 23, 1892.
NORTH CAROLINA: Type specimen as cited under type locality; *Vasey*, in 1878; *Kelsey*, April, 1890.

WEST VIRGINIA: Greenbrier County, altitude 750 to 1,020 meters, *Heller* 841, May 17, 1893; near Hinton, Summers County, and McGraw, Wyoming County, *Morris* 958, 1328, July 9 and August 23, 1900.
TENNESSEE: Cocke County, *Kearney* 701, August 26, 1897.

3. **Zizia cordata** (Walt.) Koch in DC. Prodr. **4**: 100. 1830. FIG. 22.

Smyrnium cordatum Walt. Fl. Car. 114. 1788.
Thaspium trifoliatum apterum Gray, Man. ed. 2. 156. 1856.

Basal leaves mostly long-petioled, cordate or even rounder, crenately toothed, very rarely lobed or divided; stem leaves simply ternate or quinate, the leaflets ovate to lanceolate, serrate, incised, or even parted; fruit ovate, 3 mm. long; seed section larger than in *Z. aurea.*

Type locality not given, but presumably in the Carolinas.

From eastern Canada to North Carolina and Alabama and extending westward to Assiniboia, Alberta, Washington, and Colorado.

Specimens examined: We cite but few of the numerous specimens examined.
CONNECTICUT: Fairfield, *Eames*, September 26, 1895.
NEW JERSEY: Granton, *Van Sickle*, June 3, 1895.
MARYLAND: Near Baltimore, *Foreman*, in 1875.
DISTRICT OF COLUMBIA: Little Falls, *Vasey*, in 1873.
NORTH CAROLINA: Asheville, *McCarthy*, May, 1888.
ALABAMA: Auburn, Lee County, *Earle & Baker*, May 7, 1898.
TENNESSEE: Lookout Mountain, Hamilton County, *Pollard & Maxon* 421, August 6, 1900.
PENNSYLVANIA: Easton, *Porter*, September 25, 1891.
NEW YORK: Ithaca, *Pearce*, May 28, 1883.
OHIO: Lancaster, *Bigelow.*
ILLINOIS: Near Chicago, *Babcock;* West Chicago, *Umbach*, July 9, 1898.
MISSOURI: Eagle Rock, *Bush* 191, June 6, 1897; Grain Valley, *Bush*, July 4, 1898.
IOWA: Minnesota line, *Pammel* 594, July 21, 1897.
MINNESOTA: Fort Snelling, *Mearns*, September 4, 1889.
SOUTH DAKOTA: Black Hills, *Forwood* 139, June 7, 188.
WYOMING: Horse Creek, *Nelson* 34, June 6, 1893.
COLORADO: South Park, *Wolf* 727, June, 1873.
UTAH: Wahsatch Mountains, *Jones*, August, 1883.
IDAHO: Forks of Wood River, *Henderson* 3406, July 25, 1895.
WASHINGTON: Pullman, *Piper* 1557, July 24, 1893; same station, *Elmer* 890, May, 1897.
ASSINIBOIA: Wood Mountain, *Macoun* 10680, June 14, 1895.
ALBERTA: Milk River, *Macoun* 10679, July 17, 1895.

24. HARBOURIA C. & R. Rev. N. Am. Umbell. 26 and 125. 1888.

Calyx teeth evident. Fruit flattened laterally, ovate, with narrow commissure (carpels appearing nearly distinct), tuberculate-roughened. Carpel (round in section) with equal broad obtuse very prominent ribs, a small group of strengthening cells in each; the narrow commissure prominently corky-thickened, partly divided by a groove. Stylopodium depressed or wanting. Oil tubes large, solitary in the intervals, 2 on the commissural side. Seed section nearly round.

Glabrous perennials, with 1 to 3 leaves which are ternately decompound and with narrowly linear or filiform segments, involucre and involucels of few subulate bracts, and long-peduncled umbels (mostly in pairs) of yellow flowers.

A monotypic genus, based on *Thaspium trachypleurum* Gray, belonging to the Rocky Mountain region of the United States.

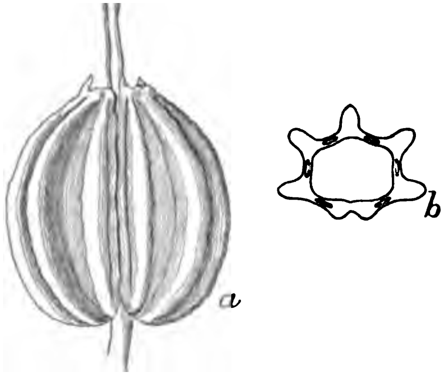


FIG. 23.—Harbouria trachypleura: *a*, *b*, × 8.

1. **Harbouria trachypleura** (Gray) C. & R. Rev. N. Am. Umbell. 125. 1888. FIG. 23.

Thaspium trachypleurum Gray, Proc. Acad. Philad. 1862: 63. 1863.

Cicuta trachypleura Watson, Bibl. Index 417. 1878.

From 3 to 6 dm. high; leaf segments mucronulate; umbels (mostly 2 long-peduncled ones) 15 to 25-rayed; rays 1 to 2.5 cm. long; pedicels 4 to 6 mm. long; fruit 4 mm. long.

Type locality, "on the mountains at middle and lower elevations," Colorado; collected by *Hall & Harbour*, no. 215, in 1862; type in Herb. Gray, duplicate in U. S. Nat. Herb.

In the foothills of Colorado, and extending into Wyoming and New Mexico.

Specimens examined:

COLORADO: *Hall & Harbour* 215, in 1862; St. Vrain Canyon, *Coulter*, May 26, 1873; Central City, *Alice Eastwood*, October, 1892; Morrison, *Bethel* 3612, June, 1895; Larimer County, *Osterhout*, July, 1895; Gore Mountains, altitude 2,850 meters, *Bethel* 3613, August, 1895; near Fort Collins, altitude 1,650 meters, *Baker*, May 24, 1896.

WYOMING: Laramie Hills, *Nelson*, May–June, 1893; Table Mountain, *Nelson* 160, June 2, 1894; Uinta County, *Stevenson* 31, July 17, 1894; Medicine Bow Mountains, Albany County, *Nelson* 3365, August 10, 1897.

25. CICUTA L. Sp. Pl. 1 : 255. 1753.

Calyx teeth rather prominent. Fruit flattened laterally, oblong to orbicular, glabrous. Carpel with strong flattish corky ribs, the laterals largest (at least in section), without strengthening cells. Stylopodium low, sometimes low conical. Oil tubes solitary in the intervals, 2 on the commissural side. Seed nearly terete or somewhat dorsally flattened, with face from plane to slightly concave.

Smooth poisonous marsh perennials, with pinnately compound leaves and serrate leaflets, involucre of few bracts none, involucels of several slender bractlets, and white flowers.

First species cited, *C. virosa* L.

A genus of about 10 species, chiefly North American, one species being Mexican, another (the type) European.

Immediately following our Revision, in which but three North American species of *Cicuta* were recognized, Professor Greene (Pittonia **2**:1–11. 1889) revised the genus, disclaiming the presence of *C. virosa* L. in our flora, and segregating several western species. After a study of very much more abundant material, we have concluded that his points are well taken, and the following presentation follows largely the lines which he proposed. In his revision Professor Greene laid special stress upon characters supplied by the rootstocks and roots, and proposed the following key:

*Root axis very short, nearly or quite erect, not enlarged, its partitions crowded.
    +- Roots all alike, slender fibrous.
        C. virosa.
    +- +- Main roots coarse, elongated, fleshy fibrous.
        C. bolanderi, *C. occidentalis*, *C. purpurata* [*douglasii*].
    +- +- +- Main roots oval or oblong, fleshy tuberiform.
        C. maculata [and *curtissii*], *C. bulbifera.*
**Rhizomatous species; the root axis greatly enlarged, horizontal, only partly or not at all subterranean, emitting fibrous roots from beneath.
    C. vagans, *C. californica.*

We reproduce the above key in the hope that it may be further tested in the field, for with the material at our command we have not been able to follow it fully. While we recognize in Professor Greene's typical material the differences suggested, we do not find them constant. The fleshy thickening of the rootstocks and their direction, as well as the thickness and elongation of the roots, seem to vary with the nature of the substratum, as might be expected. Nevertheless, we find that the differences thus suggested to Professor Greene have served to call attention to what seem to us better characters upon which to base his species.

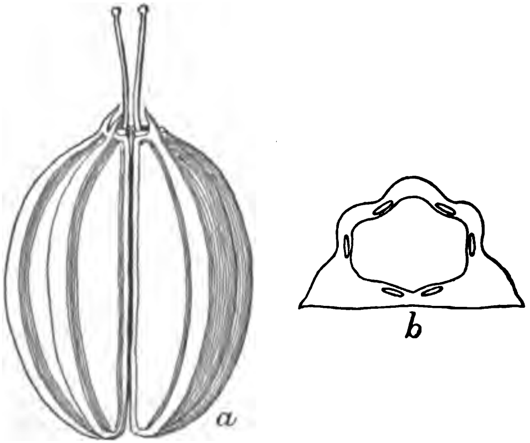


Fig. 24.—Cicuta maculata: *a, b,* ×8.

Aside from the curious bulbiferous habit of *C. bulbifera*, the other species seem to be best grouped primarily by their oblong or orbicular fruits, further separation being made upon differences in the fruit ribs and in the foliage.

We have included, chiefly under *C. occidentalis*, several forms which we do not feel justified in separating, but which better and more abundant material may prove to be worthy of independent rank.

Axils of leaves bearing no bulblets.
    Fruit orbicular.
        Leaves simply pinnate .... 1. *C. californica.*
        Leaves twice to thrice pinnate.
            Ribs very broad; oil-tubes very narrow.
                Leaflets thickish, lanceolate to ovate-lanceolate, closely and sharply toothed or even cleft, strongly reticulate beneath .... 2. *C. douglasii.*
                Leaflets thinner, linear-lanceolate to lanceolate, not so closely or sharply serrate, not strongly reticulate beneath .... 3. *C. vagans.*

Ribs narrower; oil-tubes broad.
Leaflets linear-lanceolate; Californian .... 4. *C. bolanderi.*
Leaflets lanceolate to oblong-lanceolate; southeastern United States,
5. *C. curtissii.*
Fruit oblong.
Fruit not constricted at the commissure; lateral ribs much the largest; eastern,
6. *C. maculata.*
Fruit constricted at the commissure; ribs approximately equal in surface display;
Rocky Mountain region .... 7. *C. occidentalis.*
Axils of upper leaves bearing bulblets .... 8. *C. bulbifera.*

1. **Cicuta californica** Gray, Proc. Am. Acad. **7**: 344. 1867.

C. virosa californica C. & R. Rev. N. Am. Umbell. 130. 1888, as to name, not as to specimen.

Rather stout and erect, 9 to 15 dm. high; rootstock "freely branching," abruptly enlarged beneath the aerial stem; leaves simply pinnate; leaflets lanceolate to ovate-lanceolate, 5 to 13 cm. long, rounded at base, serrate, often deeply lobed on the lower side; fruit broadly ovate, 3 mm. long, with approximately equal and prominent ribs, and narrow intervals.

Type locality, "Monterey," Cal.; collected by *Hartweg*, no. 1754; type in Herb. Gray. This is the first specimen cited, and associated with it are *Brewer* 707, and *Kellogg* from "San Francisco" (probably Oakland Hills).

Along the margins and in the shallow waters of mountain streams in the coast region of California from Mendocino County to Monterey County.

Specimens examined:

CALIFORNIA: Mendocino County, *G. R. Vasey*, in 1875; Oakland Hills, *Greene*, April, 1890.

2. **Cicuta douglasii** (DC.) C. & R.

?Sium? douglasii DC. Prodr. **4**: 125. 1830.
Cicuta crassifolia Nutt. in Rep. Wilkes' Exped. **17**: 316. 1874.
Cicuta purpurata Greene, Pittonia **2**: 8. 1889.

Stout, erect, 9 to 12 dm. high, with glaucous stem; the short rootstock giving rise to numerous slender fibrous roots above and thick elongated ones below; leaves twice pinnate, rather narrow in outline; leaflets thickish, lanceolate to ovate-lanceolate, 5 to 10 cm. long, sessile or nearly so, closely and sharply serrate to incised, the teeth often somewhat falcate, strongly reticulate beneath; fruit orbicular, 2 mm. long, the very broad and low ribs approximately equal in surface display (the laterals very much the largest in section), leaving very narrow intervals and small oil tubes.

Type locality, "in America boreali occid.;" collected by *Douglas;* type in Herb. London Hort. Soc., duplicate in U. S. Nat. Herb.

In marshes, from Oregon to Alaska.

Specimens examined:

OREGON: Swamps near Dairy, Klamath County, *Applegate*, August 11, 1895.

WASHINGTON: "In marshes at the confluence of the Columbia," *Douglas* (type); along Straits of De Fuca, *Scouler; Cooper;* Yakima River, *Greene*, August 14, 1889 (type of *C. purpurata*); *Henderson*, July–August, 1892.

BRITISH COLUMBIA: "Kooskooskee River," *Wilkes' Exped.* 560.

ALASKA: Karluk River, *Bean*, in 1889; Khantaak Island, *Funston* 71, July 22, 1892.

3. **Cicuta vagans** Greene, Pittonia **2**: 9. 1889.

Stout, 6 to 15 dm. high, the branches often diffuse or reclining and spreading over a considerable area; rootstocks often very large and fleshy-thickened, horizontal or erect, aerial or nearly so, giving rise to few slender fibrous roots and numerous thick elongated ones, but rootstocks sometimes not at all thickened; leaves twice to thrice pinnate, rather broad in outline; leaflets rather thin, linear-lanceolate to lanceolate, 3 to 7.5 cm. long, sessile or nearly so, usually cuneate at base, more remotely and less sharply serrate than in *C. douglasii*, the teeth not at all falcate, and the lower surface not strongly reticulate; fruit orbicular, 2 to 3 mm. long, the ribs and oil tubes as in *C. douglasii.*

Type locality, "in an estuary of Lake Pend Oreille, Idaho;" collected by *Greene*, August 9, 1889; type in Herb. Greene, duplicate in U. S. Nat. Herb.

In wet places and marshes, from northeastern California to Idaho, British Columbia, and Vancouver Island.

Specimens examined:

CALIFORNIA: Wet places, Truckee, Nevada County, *Sonne* 6, August, 1892.

OREGON: Near Fort Klamath, altitude 1,470 meters, *Leiberg* 700, August 11, 1894.

WASHINGTON: Wet or boggy meadows, Falcon Valley, *Suksdorf*, July–September, 1883; Kitsap County, *Piper* 640, August 3, 1889; Samish Lake, Whatcom County, *Suksdorf* 1192, July 16, 1890; near Sumas, Whatcom County, and Olympia, Thurston County, *Henderson* 373, July–August, 1892; near Corby, *Grant*, February, 1896 (rootstocks); open swamp, upper valley of the Nesqually, *Allen* 255, July 14–September 17, 1896; Waitsburg, Walla Walla County, *Horner* 620, September 11, 1897; near Montesano, Chehalis County, *A. A. & E. Gertrude Heller* 4069, July 20, 1898.

IDAHO: Lake Pend Oreille, *Greene*, August 9, 1889 (type); valley of Lake Tesemini, Kootenai County, *Sandberg* 686, July 21, 1892; near Ketchum, Alturas County, *Henderson* 3402, July 23, 1895; wet soil, valley of North Fork of Cœur d'Alene River, altitude 930 meters, *Leiberg* 535, August 14, 1895.

BRITISH COLUMBIA: Long Lake, Vancouver Island, *Macoun*, August 23, 1889; near Westminster, *Macoun* 292, August 28, 1893.

This species is very apt to be confused with *C. douglasii*, but differs in its general habit, its foliage, and usually in its much enlarged and more or less aerial rootstocks.

4. **Cicuta bolanderi** Watson, Proc. Am. Acad. **11**: 139. 1876.

Stout, erect, 12 to 27 dm. high; rootstock short and thickish, giving rise below to numerous somewhat thickened elongated roots; leaves twice to thrice pinnate; leaflets linear-lanceolate and acuminate, 2 to 4 cm. long, closely and sharply serrate (teeth with spinulose tips), lower leaflets petiolate and often deeply lobed; fruit orbicular, 2 mm. long, the narrow ribs approximately equal (in section as well as in surface display), leaving broad intervals and large oil tubes, which are sunk in the channeled seed.

Type locality, "at Suisun, California, in salt marshes;" collected by *Bolander;* type in Herb. Gray.

Known only from type locality.

Specimens examined:

CALIFORNIA: In Suisun Marsh, *Greene*, September 29, 1889.

In describing the habitat of this very local species Professor Greene says (Pittonia 2:7. 1889): "Very plentiful about Teal Station in the midst of the Suisun Marsh, and also near Martinez on the opposite side of Suisun Bay, growing among tall reeds and sedges in a hard but coarse and loose sod, the roots and base of the stem laved daily by the brackish tide water."

5. **Cicuta curtissii** C. & R., sp. nov.

Resembling *C. maculata* and heretofore confused with it, but differs as follows: rootstock much thicker; leaflets thickish, conspicuously reticulate beneath; fruit orbicular, 2 mm. long, constricted at the commissure; ribs approximately equal in surface display; the laterals largest in section, but not wedge-shaped or closely contiguous; dorsal and intermediate ribs about as broad as the intervals; oil tubes large.

Type locality, banks of streams, Duval County, Fla.; collected by *Curtiss*, no. 1030; type in U. S. Nat. Herb.

From southern Virginia and southeastern Kentucky to Florida and Louisiana.

Specimens examined:

VIRGINIA: Near Franklin, Southampton County, *Heller* 1165, July 22–29, 1893.

KENTUCKY: Near Poor Fork, Harlan County, *Kearney* 186, August, 1893.

NORTH CAROLINA: Near Linville, Mitchell County, *Kelsey*, September 15, 1890; swampy places near Biltmore, *Biltmore Herb.* 1965*a*, July 28, 1897.

GEORGIA: On banks of Yellow River, Gwinnett County, *Small*, July 20, 1893.

FLORIDA: Type specimen as cited under type locality; near Jacksonville, *Curtiss* 4917, June–August, 1894; near Eustis, Lake County, *Nash* 1025, June 16–30, 1894.

ALABAMA: Deep swamps near Mobile, *Mohr*, August 3, 1892; Sylacauga, Talladega County, *Pollard & Maxon* 218, July 19, 1900.

MISSISSIPPI: Near Madison, *Phares*, in 1883.

LOUISIANA: Near Covington, *Drummond*, in 1832.

6. **Cicuta maculata** L. Sp. Pl. 1: 256. 1753. FIG. 24.

C. virosa maculata C. & R. Rev. N. Am. Umbell. 130. 1888.

Stout, erect, branching, 9 to 18 dm. high; rootstock short, giving rise to slender fibrous roots above, and a fascicle of thick and usually short roots below; leaves large and broad, twice to thrice pinnate; leaflets rather thin, from narrowly lanceolate to oblong-lanceolate, 5 to 13 cm. long, coarsely and sharply serrate, midrib and primary veins distinct, but reticulation indistinct; fruit oblong, 4 mm. long, not constricted at the commissure; lateral ribs much the largest, wedge-shaped in section and closely in contact with those of the other carpel, the two contiguous ones together forming a broad flat band; dorsal and intermediate ribs comparatively slender and leaving broad intervals; oil tubes large.

Type locality, "in Virginae aquosis;" collected by *Clayton.*

From New Brunswick to Virginia, west to South Dakota and Missouri.

Specimens examined:

New Hampshire: Low ground, near Jaffrey, *Deane*, July 16–27, 1890.
Vermont: Burlington, *Grout*, August 9, 1893.
Massachusetts: Near Amherst, *Mrs. Alice Stevens*, August 1, 1895; near Winchendon, Worcester County, *Pollard*, September 3, 1895.
Connecticut: Near Greens Farms, *Pollard* 155, July 7, 1894; near Stratford, *Eames*, August 16, 1894.
New York: Near Ithaca, *Coville*, July 11, 1885; same station, *Rowlee*, July 17, 1890; near Van Cortlandt, *Pollard*, May, 1893.
Pennsylvania: Near Wrightsville, York County, *Small*, July 7, 1890.
New Jersey: Near Clifton, Passaic County, *Nash*, July 25, 1891; near Stockholm, *Van Sickle*, August 10, 1895.
Maryland: Kings Creek, *Holmes*, July 24, 1890; near Bladensburg, *Pollard*, August 4, 1895.
District of Columbia: Near Washington, *Vasey*, in 1873; Zoological Park, *Pollard* 508, July 26, 1895.
Virginia: Along Peak Creek, Pulaski County, altitude 660 meters, *Small*, July 16, 1892; near Belfield, Greenville County, *Heller* 1002, June 19, 1893.
Ohio: Near Painesville, *Werner*, August 7, 1886; near Niles, *Ingraham*, July, 1891; near Oberlin, *Ricksecker*, June, 1895.
Ontario: Point Abino, *Pollard*, August 28, 1896.
Indiana: Near Crawfordsville, *Rose*, June 23, 1892.
Michigan: Near Owosso, *Hicks*, August 9, 1889; near Agricultural College, *Wheeler*, October 8, 1891.
Illinois: River bank, Naperville, *Umbach*, July 23, 1897.
Missouri: Near Dodson, *Bush* 390, September 26, 1897.
Wisconsin: Camp Douglas, *Mearns* 398, July 12, 1890.
Minnesota: Fort Snelling, *Mearns*, June 25, 1891.
South Dakota: Near Agricultural College.
Nebraska: Niobrara, *Clements* 2950, July 14, 1893.

A group of western forms, on the plains from Minnesota to Texas, is perhaps to be referred here, but certain differences suggest the possibility of segregation. The leaves are thicker and strongly reticulated, as in *C. curtissii*, and two types of fruit are represented—one with very broad corky ribs and narrow intervals, the other with ribs and intervals as in true *C. maculata* but with fruit almost orbicular. Our material is insufficient for any more definite reference, and the problem is commended to the botanists of the region.

These uncertain specimens are as follows:

Minnesota: Near Winona, *Holzinger*, September 14, 1889; Fort Snelling, *Mearns*, August 21, 1891.
Iowa: Near Ames, *Ball* 234, July 18, 1896.
Kansas: Near Onaga, *Crevecoeur* 24, in 1892.
Oklahoma: Stillwater, *Waugh* 32, September 5, 1893.
Indian Territory: *Palmer* 150, in 1868.
Arkansas: Near Fort Smith, *Bigelow*, in 1853–54.
Texas: *Lindheimer* 615, in 1847; *Wright*, in 1851.

Cicuta maculata angustifolia Hook. Fl. Bor. Am. 1: 259. 1834.

Type locality, "on the Saskatchawan."

We have seen no authentically named specimens of this variety. It is perhaps not a variety of *C. maculata*, but should remain here until properly disposed of. To this variety perhaps should be referred the *Cicuta* with very narrow leaves collected in 1899 by Williams on the Yukon.

7. **Cicuta occidentalis** Greene, Pittonia 2: 7. 1889.

Stout, 9 to 18 dm. high; rootstock short, giving rise to slender roots above, and a fascicle of thick and elongated ones below; leaves twice pinnate; leaflets from linear-lanceolate to lanceolate, 5 to 8 cm. long, sharply serrate and conspicuously reticulate beneath; fruit oblong, 3 mm. long, constricted at the commissure, the ribs approximately equal in surface display (laterals largest in section), the intervals broad; oil tubes large.

Type locality, Trinidad, Colo., "near the New Mexican line;" collected by *Greene*, July 17, 1889; type in Herb. Greene, duplicate in U. S. Nat. Herb.

In the Rocky Mountain region, from the Black Hills of South Dakota to Idaho, and southward through Colorado and northern Nevada to New Mexico.

Specimens examined:

SOUTH DAKOTA: Piedmont and Little Elk Creek, Black Hills, altitude 1,200 meters, *Rydberg* 723, June 28, 1892; near Forest City, *Griffiths & Schlosser*, September 3, 1892.

NEBRASKA: On Middle Loup River, near Mullen, Hooker County, Sand Hills region, *Rydberg* 1491, July 26, 1893.

WYOMING: Banks of Snake River, *Forwood*, August 15, 1881; Meadow Creek, *Nelson* 790, August 9, 1894; Ione Ranch, *Nelson* 1557, August 10, 1895; Upper Madison Canyon, Yellowstone Park, *Rydberg* 4611, August 3, 1897; Snake River, Yellowstone Park, *A. & E. Nelson* 6565, August 20, 1899.

MONTANA: Columbia Falls, *Williams* 375, September 12, 1892.

IDAHO: Blackfoot, *Palmer* 298, July 8, 1893.

NEVADA: Spring Valley, altitude 1,800 meters, *Watson* 441, September, 1868.

UTAH: Near Salt Lake City, altitude 1,290 meters, *Jones* 1909, August 18, 1880; Springville, altitude 1,350 meters, *Jones* 5615, August 11, 1894.

COLORADO: Trinidad, *Tracy* 38, June 8, 1887; same station, *Greene*, July 17, 1889 (type); Bear Creek, near Morrison, *Greene*, July 28, 1889; college grounds, State Agricultural College, *Buffum* 286, August 5, 1890; Hotchkiss, Delta County, altitude 1,650 meters, *Cowen*, June 23, 1892; Fort Collins, altitude 1,500 meters, *Cowen*, July, 1893 and 1895.

NEW MEXICO: Las Vegas, *G. R. Vasey*, July 1881; Santa Fe, altitude 2,160 meters, *A. A. & E. Gertrude Heller* 3814, July 5, 1897; in the White Mountains, Lincoln County, altitude 1,890 meters, *Wooton* 233, July 28, 1897.

As defined above, *C. occidentalis* presents consistent characters and geographical distribution. Certain outlying forms, however, if referred here, would considerably extend the range and modify the specific limitations. Our material is insufficient to justify us in segregating these forms, but we present them as follows:

(1) A Californian form, called *forma frondosa* by Professor Greene, and often confused with *C. bolanderi*, has leaflets which are much larger (becoming 10 cm. long) and more coarsely toothed.

CALIFORNIA: Fort Tejon, *Xantus de Vesey* 36, in 1857–58; Mohawk Valley, *Lemmon*, May, 1878; San Luis Obispo, *Lemmon*, June, 1886; Mohawk Valley, *Lemmon*, May 28, 1889; Tehachapi, *Greene*, June 24, 1889; swampy flats, Los Angeles County, *Hasse*, July-September, 1890 and 1891.

OREGON: *Cusick* 2057, in 1898.

(2) An Oregon-Idaho form, with broader and thinner leaflets.

OREGON: Lower Wallowa Valley, *Cusick* 2256, July 26–August 10, 1899.

IDAHO: Near Granite Station, Kootenai County, *Leiberg* 636, June–August, 1892.

(3) An Arizona form, with broader and thinner leaflets, and fruit with broader ribs and narrower intervals.

ARIZONA: Oak Creek, *Rusby*, August 3, 1883; same station, *Lemmon*, August, 1884; Bakers Butte, *Toumey* 189, July 19, 1892.

(4) A Wyoming form, with orbicular fruit, but geographically distant from the orbicular-fruited species, and associated geographically with *C. occidentalis*.

WYOMING: Near Fort Russell, *Havard*, in 1893.

8. **Cicuta bulbifera** L. Sp. Pl. **1**: 255. 1753.

Rather slender, 3 to 9 dm. high; leaves twice or thrice pinnate (sometimes appearing ternate); leaflets linear, sparsely toothed, 2.5 to 5 cm. long; upper axils bearing clustered bulblets; fruit (very rarely matured) orbicular, 2 mm. long, constricted at the commissure; ribs broad and low, approximately equal in surface display, intervals narrow.

Type locality, "Virginia, Canada;" collected by *Clayton*.

From Nova Scotia to Maryland, westward to Nebraska and Montana.

Specimens examined:

ONTARIO: Thousand Islands of the St. Lawrence, *Ward*, August 10, 1879; Ottawa, *Macoun*, August 10, 1894; Kingston, *Fowler*, August 27, 1895; Point Abino, *Pollard*, August 28, 1896.

MAINE: Dead River, *Fernald & Strong* 446, August 13, 1896.

VERMONT: Peacham, *Blanchard*, August 22, 1884.

MASSACHUSETTS: Essex County, *Oakes;* Concord River, Ashland, *Woolson*, August, 1872; Swampscott, *Summers*, August 10, 1887.

CONNECTICUT: Milford, *Eames*, August 28, 1895.

NEW JERSEY: Near Clinton, Passaic County, *Nash*, September 25, 1892; Stockholm, *Van Sickle*, August 10, 1895.

MARYLAND: Locust Point, Baltimore, *Katharine Taylor*, September 11, 1891.

NEW YORK: Near Ithaca, *Pearce*, September 27, 1884; *Cornell Univ. Coll.*, September 20, 1886.

PENNSYLVANIA: Lancaster County, *Porter*, September 4, 1863; Long Pond, Luzerne County, *A. A. & E. Gertrude Heller* 551, September 16–17, 1892.

OHIO: Near Niles, *Ingraham*, August, 1891.

INDIANA: Clarke, Lake County, *Umbach*, September 12, 1896.

MICHIGAN: Grayling, *Hicks*, August 17, 1889; near Agricultural College, *Wheeler*, August 30, 1890.

MINNESOTA: Winona, *Holzinger*, September 15, 1888; Fort Snelling, *Mearns*, August 27, 1891; Marine Mills, Washington County, *Taylor*, August, 1892.

NEBRASKA: On Middle Loup River, near Thedford, Thomas County, Sand Hills region, *Rydberg* 1737, September 7, 1893.

MONTANA: MacDonald Lake, *Williams* 902, August 6, 1895.

IDAHO: Near Granite, Kootenai County, *Leiberg*, June, 1892; same station, *Sandberg* 789, July 29, 1892.

26. **DERINGA** Adans. Fam. Pl. 2: 498. 1763.

Cryptotaenia DC. Coll. Mém. 5:42. 1829.

Calyx teeth obsolete. Fruit flattened laterally, linear-oblong, glabrous. Carpel with obtuse equal ribs, each subtended by a very broad group of strengthening cells (2 groups also on the commissural side). Stylopodium slender conical. Oil-tubes solitary beneath each rib (as well as in the intervals), 2 to 4 on the commissural side. Seed face plane or nearly so.

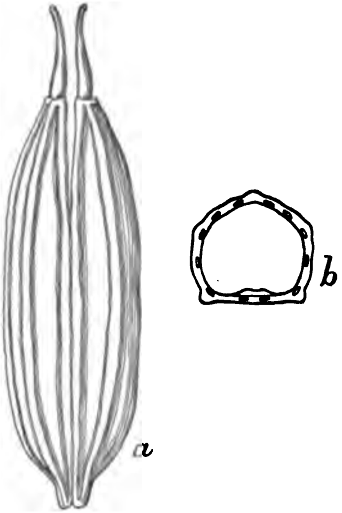


FIG. 25.—Deringa canadensis: *a*, *b*, × 8.

Glabrous perennials, with thin trifoliolate leaves, no involucre, involucels of minute bractlets or none, and white flowers.

Type species, *Sison canadense* L. Sp. Pl. 1: 252. 1753.

A genus of 3 or 4 species, one of which is North American.

1. **Deringa canadensis** (L.) Kuntze, Rev. Gen. Pl. 1: 266. 1891. FIG. 25.

Sison canadense L. Sp. Pl. 1:252. 1753.
Cryptotaenia canadensis DC. Prodr. 4: 119. 1830.

Erect, rather slender, 3 to 9 dm. high, branching; leaflets large, ovate, 5 to 13 cm. long, acute or acuminate, doubly serrate, often lobed; lateral leaflets oblique at base, usually sessile or nearly so; terminal leaflet abruptly narrowed into a petiolule (usually winged); umbels irregular and unequally few-rayed; pedicels very unequal, from 2 to 30 mm. long; fruit 4 to 6 mm. long, often becoming curved.

Type locality, "in America septentrionali."

From New Brunswick to Georgia, and west to South Dakota and Texas.

Specimens examined: Very few of the specimens of this common species are cited.

ONTARIO: Kingston, *Fowler*, September 3, 1883; Ottawa, *Macoun*, August 9, 1894.
VERMONT: Peacham, *Alice Stevens*, June 25, 1892; Manchester, *M. A. Day* 86, July 1, 1898.
MASSACHUSETTS: Great Barrington, *Pollard*, August 1, 1894; Hadley, *Alice Stevens*, July 20, 1895.
CONNECTICUT: Bridgeport, *Eames*, August 8, 1895.
NEW YORK: Oxford, *Coville*, June 21, 1883.
MARYLAND: Laurel, *Knowlton*, June 13, 1897.
DISTRICT OF COLUMBIA: Zoological Park, *Pollard* 529, July 26, 1895.
PENNSYLVANIA: Rawlinsville, in 1882.
OHIO: Lorain County, *Ricksecker*, July 9, 1894.
INDIANA: Near Indianapolis, *Coville*, August, 1892.
ILLINOIS: Near Chicago, *Babcock;* Naperville, *Umbach*, June 28, 1898.

Minnesota: Fort Snelling, *Mearns*, August, 1891 and 1896; Acton, Meeker County, *Frost*, June, 1892; Winona, *Holzinger*, June, 1890.
Iowa: Fayette County, *Fink*, June 5, 1894.
Missouri: Near St. Louis, *Drummond*, in 1832; Jackson County, *Bush* 341, June 14, 1896.
Arkansas: Fort Smith, *Bigelow*, in 1853–54.
Kansas: Lawrence, *Stevens*.
Nebraska: Newcastle, *Clements*, June 21, 1893.
South Dakota: Brookings County, *Williams*, September 21, 1893.

27. **TAENIOPLEURUM** C. & R. Bot. Gaz. **14**: 283. 1889.

Calyx teeth prominent. Fruit flattened laterally, oblong, glabrous. Carpel with broad salient ribs, each tipped with a large group of strengthening cells. Stylopodium prominent and conical. Oil tubes very large, solitary in the intervals, 2 on the commissural side, and a small accessory one beneath each group of strengthening cells. Seed dorsally flattened, sulcate beneath the oil tubes, becoming loose in the pericarp and invested by a layer of secreting cells, the face plane or somewhat concave.

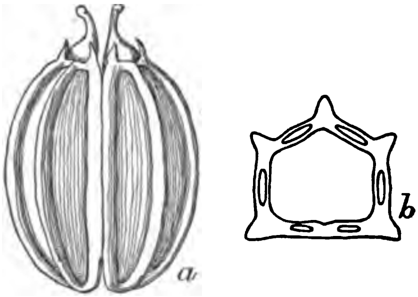


Fig. 26.—Taeniopleurum howellii: *a*, *b*, × 10.

Smooth erect herbs, from a fascicle of thickened fibers, with ternate-pinnate leaves, toothed (usually broad) leaflets, involucre and involucels of numerous conspicuous bracts, and white flowers.

A monotypic genus (based on *Carum howellii* C. & R.) belonging to Oregon and California.

1. **Taeniopleurum howellii** C. & R. Bot. Gaz. **14**: 284. 1889. Fig. 26.

Carum howellii C. & R. Rev. N. Am. Umbell. 129. 1888.
Ataenia howellii Greene, Pittonia **1**: 274. 1889.

Stem rather stout, 9 to 12 dm. high; leaves few, ternate then once or twice pinnate; leaflets lanceolate to ovate, strongly toothed or lobed; umbels many-rayed, with involucre of long narrowly oblanceolate bracts (becoming reflexed), and involucels of prominent lanceolate scarious-margined bractlets; rays 3 to 7 cm. long; pedicels 6 to 10 mm. long; fruit 3 to 4 mm. long.

Type locality, wet places, "Grant's Pass," Josephine County, Oreg.; collected by *Howell*, no. 710, July 13, 1887; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

From southern Oregon to Mendocino and Mariposa counties, Cal.

Specimens examined:

Oregon: Type specimens, as cited under type locality.
California: Near Mariposa, Mariposa County, *Congdon*, September–October, 1892; Round Valley, Mendocino County, *Chesnut*, June, 1898.

28. CARUM L. Sp. Pl. 1: 263. 1753.

Calyx teeth prominent for the size of the fruit. Fruit flattened laterally, orbicular to oblong, glabrous. Carpel with filiform or inconspicuous ribs, with or without strengthening cells. Stylopodium conical. Oil tubes large and solitary in the intervals, 2 to 6 on the commissural side. Seed dorsally flattened, more or less sulcate beneath the oil tubes; the face plane or slightly concave.

Smooth erect slender herbs, with tuberous or fusiform fascicled roots, pinnate leaves with few linear leaflets (in our native species), involucels of few to many bracts, and white flowers.

Type species, *Carum carui* L.

A genus of 22 species, belonging to the northern hemisphere, 4 species being found in western North America.

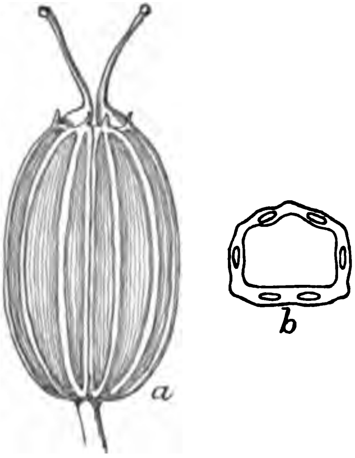


FIG. 27.—Carum oreganum: *a*, × 8; *b*, × 10.

Stylopodium very large, with short stout styles .... 1. *C. kelloggii.*
Stylopodium low, with long slender styles.
  Fruit orbicular and small (2 mm.) .... 2. *C. gairdneri.*
  Fruit oblong and larger (3 to 4 mm.).
    Fruit rounded at both ends, with inconspicuous ribs .... 3. *C. oreganum.*
    Fruit narrowed at both ends, with conspicuous ribs.............. 4. *C. lemmoni.*

1. **Carum kelloggii** Gray, Proc. Am. Acad. 7: 344. 1867.

Ataenia kelloggii Greene, Pittonia 1: 274. 1889.

Resembling *C. gairdneri*, but somewhat stout, from a fascicle of thickened fibers, with lower leaves ternate or biternate with pinnate divisions and linear segments; involucre and involucels more prominent and rather scarious; fruit larger, oblong, 3 to 5 mm. long, with small ovate calyx teeth, very prominent stylopodium, stout styles about the same length, and inconspicuous ribs; seed sulcate beneath the large oil tubes.

Type locality, "San Jose," Cal.; collected by *Brewer*, no. 832; type in Herb. Gray. This is the first specimen cited, and associated with it are "Oakland," *Bolander*, and "Bolinas," *Kellogg*.

Central California.

Specimens examined:

CALIFORNIA: Near San Francisco, *Wilkes Exped.* 1416; San Antonio Creek, *Kellogg & Harford* 308, August 14, 1868; Hamilton Station, Tuolumne County, *Lemmon* 72, August 11, 1889; Oakland Hills, *Lemmon* 75, August, 1889; Ocean View, San Francisco, *Alice Eastwood*, September 2, 1894; Amador County, altitude 450 meters, *Hansen* 72, August 10, 1896.

2. **Carum gairdneri** (Hook. & Arn.) Gray, Proc. Am. Acad. **7**: 344. 1867.

Atenia gairdneri Hook. & Arn. Bot. Beechey, 349. 1840.
Edosmia gairdneri Nutt. in Torr. & Gray, Fl. **1**: 612. 1840.

Stem 3 to 12 dm. high, from fascicled tuberous or fusiform roots; leaves few, usually simply pinnate, with 3 to 7 linear (sometimes almost filiform) leaflets 5 to 15 cm. long (the lower rarely pinnate); upper leaves usually simple; umbels 6 to 15-rayed, with involucre of several bracts or none, and involucels of linear acuminate bractlets; rays 2.5 to 4 cm. long; fruit broadly ovate or nearly orbicular, small, 1 to 2 mm. long, with small ovate calyx teeth, low conical stylopodium, and long slender styles; seed terete.

Type locality, near San Francisco or Monterey, Cal.; collected by *Douglas*.

From British Columbia to southern California, eastward to Black Hills of South Dakota, Colorado, and Arizona.

Specimens examined:

NORTHWEST TERRITORY: Medicine Hat, *Macoun*, August 19, 1880.

ALBERTA: St. Marys River, *Macoun* 10657, July 24, 1895.

VANCOUVER ISLAND: Somas River, *Macoun*, August, 1887 and 1889.

WASHINGTON: Klickitat County, *Suksdorf*, August 22, 1881; *G. R. Vasey* 307, August, 1889; Mason County, *Piper* 1051, July 23, 1890; Yakima County, *Henderson* 2521, June 17, 1892; *Sandberg & Leiberg* 414, in 1893; Almota, *Piper* 1935, July 24, 1894; Wenatchee, *Whited*, July–August, 1896; Whitman County, *Elmer* 71, July 30, 1896; Blue Mountains, Wallawalla County, *Horner* 5, August 19, 1896.

OREGON: Near Oregon City, *Kellogg & Harford* 307, July 26, 1869; Josephine County, *Lemmon* 80, October 23, 1889; Harney County, altitude 1,400 meters, *Coville & Leiberg* 17, July 24, 1896; *Sheldon* 8202, in 1897; banks of streams, *Cusick* 2067, August–September, 1898.

CALIFORNIA: Fort Tejon, *Xantus de Vesey* 38, in 1857–58; Sonoma Valley, *Torrey* 166, in 1865; Soda Springs, Nevada County, altitude 2,100 meters, *Jones* 2527, July 26, 1881; Howell Mountain, *Brandegee*, September, 1888; Los Angeles County, *Hasse*, August 26, 1890, and July, 1891; Amador County, *Hansen* 1842, July 13, 1896; southeastern California, altitude 1,200 to 1,500 meters, *Purpus* 5632, April–September, 1897.

ARIZONA: *Palmer*, in 1869; Bill Williams Mountain, altitude 2,100 meters, *MacDougal* 322, July 22, 1898.

UTAH: City Creek Canyon, altitude 2,190 meters, *Jones* 1916, August 20, 1880.

IDAHO: Lake Pend Oreille, Kootenai County, *Sandberg* 823, August 4, 1892; Moscow, *Henderson*, August–September, 1894; Lost River Mountains, altitude 2,490 meters, *Henderson* 4064, August 14, 1895; Nez Perces County, altitude 1,050 meters, *A. A. & E. Gertrude Heller* 3422, July 14, 1896.

MONTANA: Sandcoulee, *Williams* 198, August 13, 1891; near Red Lodge, *Rose*, July 24, 1893; Forks of the Madison, *Rydberg* 4632, July 26, 1897.

WYOMING: Jacksons Lake and head of Clarks Fork, *Forwood*, August, 1881; Yellowstone Park, *Knowlton*, August 14, 1881; northwestern Wyoming, *Rose* 324, September 3, 1893; Green River, Fremont County, *Stevenson* 42, August 21, 1894; Yellowstone Park, *Rydberg* 4633, August 14, 1897; Nez Perces Creek, Yellowstone Park, *A. & E. Nelson* 6204, July 29, 1899.

SOUTH DAKOTA: Black Hills near Fort Meade, *Forwood* 148, August 19, 1887.

COLORADO: Bear River, *Alice Eastwood*, July, 1891; Steamboat Springs, *Crandall*, July 25, 1891; Routt County, altitude 1,800 meters, *Crandall* 23, July 14, 1894; Egeria Park, altitude 2,400 meters, *Bethel* 3615, August, 1895.

3. **Carum oreganum** Watson, Proc. Am. Acad. **20**: 368. 1885.

FIG. 27.

Alaenia oregana Greene, Pittonia 1: 274. 1889.

Closely resembling *C. gairdneri*, but with lower leaves more divided, and with shorter linear lobes; involucels of broader and more scarious bractlets; fruit oblong, larger, 3 to 4 mm. long; with sepals (sometimes smaller) and stylopodium as in *C. gairdneri*, but the slender styles longer; seed flattened dorsally, sulcate beneath the oil tubes, and slightly concave on the face, with central longitudinal ridge.

Type locality, "on Wappatoo Island, Oregon;" collected by *Nuttall;* type in Herb. Gray.

From northern California and Nevada to Vancouver Island and Northwest Territory.

Specimens examined:

CALIFORNIA: On Mount Shasta, Siskiyou County, altitude 1,500 to 2,700 meters, *Brown* 489, July 1–15, 1897.

OREGON: Wet prairies near Salem, *Hall* 203, in 1871; North Fork of Sprague River, altitude 1,460 meters, *Coville & Leiberg* 254, August 6, 1896.

4. **Carum lemmoni** C. & R. Bot. Gaz. **14**: 283. 1889.

Resembling *C. gairdneri*, but fruit oblong, tapering somewhat at base and apex, 3 mm. long and 2 mm. broad, and with conspicuous ribs, each of which contains a small group of strengthening cells; calyx teeth prominent and concealing the small stylopodium; styles long and slender.

Type locality, "Tuolumne forest," California; collected by *Lemmon*, August, 1889; type in U. S. Nat. Herb., duplicate in Herb. Coulter.

Tuolumne County, Cal., and perhaps extending northward to Josephine County, Oreg., and southward to Los Angeles County, Cal.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

Two other collections are tentatively referred here, but they are distinct in geographical range and somewhat in character, although subsequent collections may connect the three stations in a more general distribution. They are as follows:

Valley of Siskiyou Mountains, altitude 600 meters, Josephine County, Oreg., *Lemmon* 81, October 23, 1889. These specimens seem to be almost identical with those from Tuolumne County, Cal.

Brackish flats near Ballona, Los Angeles County, Cal., *Hasse*, September 20, 1890. In these specimens the fruit is less tapering, being more distinctly oblong, and the stylopodia are sometimes a little more prominent.

For introduced species, see page 253.

29. **ALETES** C. & R. Rev. N. Am. Umbell. 27 and 125. 1888.

Calyx teeth prominent. Fruit flattened laterally, oblong, glabrous. Carpel with equal and prominent ribs. Stylopodium wanting. Oil tubes large and solitary (several in *A. davidsoni*) in the broad intervals, 2 on the commissural side and a small one in each rib. Seed sulcate beneath the oil tubes, with face plane or slightly concave.

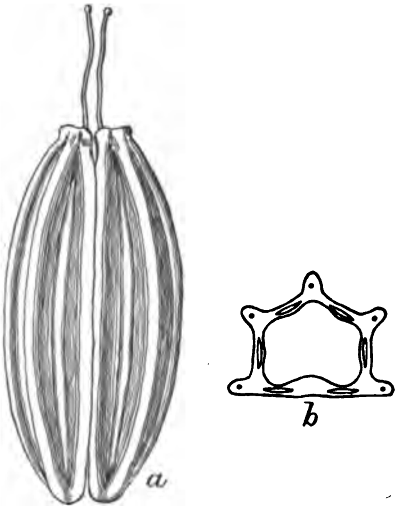


FIG. 28.—Aletes acaulis: *a*, ×8; *b*, ×10.

Acaulescent (except in *A. davidsoni*) glabrous mountain perennials, with pinnate (ternate at first in *A. davidsoni*) leaves, broad sharply toothed or cut rather distant leaflets (except in *A. tenuifolia*), mostly no involucre, involucels of linear to lanceolate bractlets, and yellow (purple in *A. davidsoni*) flowers.

Types species, *Deweya acaulis* Torr.

A genus of 4 or 5 species, belonging to the rocky foothills of Colorado, New Mexico, and Arizona.

Leaflets broad and sharply toothed.
  Flowers yellow.
    Ribs equally prominent and not winged; pedicels very short.
      Peduncles longer than the leaves.......................... 1. *A. acaulis.*
      Peduncles much shorter than the leaves...................... 2. *A. humilis.*
    Lateral ribs (and sometimes dorsals) becoming winged; pedicels 2 to 3 mm. long. 3. *A.* (?) *macdougali.*
  Flowers deep purple.................................. 4. *A.* (?) *davidsoni.*
Leaflets filiform to linear, entire.............................. 5. *A.* (?) *tenuifolia.*

1. **Aletes acaulis** (Torr.) C. & R. Rev. N. Am. Umbell. 126. 1888. FIG. 28.

Deweya (?) *acaulis* Torr. Pacif. R. Rep. **4**¹ : 94. 1856.
Oreosciadium acaule Gray, Proc. Am. Acad. **7** : 343. 1867.
Seseli hallii Gray, l. c. **8** : 288. 1870.
Musenium greenei Gray, l. c. 387. 1872.
Carum (?) *hallii* Watson, Bibl. Index 416. 1878.
Zizia hallii C. & R. Bot. Gaz. **12** : 137. 1887.

Cespitose, with peduncles 10 to 30 cm. high, often much longer than the leaves; leaflets ovate, irregularly toothed and cut, sometimes almost pinnatifid; umbels 8 to 15-rayed; rays stiff, 10 to 20 mm. long; fruit almost sessile, narrowly oblong, 4 to 5 mm. long.

Type locality (*Deweya acaulis*), "in crevices of rocks near Santa Antonita, New Mexico;" collected by *Bigelow;* type in Herb. Columbia Univ.

Rocky foothills of Colorado and New Mexico.

Specimens examined:

COLORADO: Castle Rock, near Golden, altitude 1,800 meters, *Patterson* 37, July–September, 1885; near Morrison, *Alice Eastwood*, in 1891; near Golden, *Crandall*, April 30, 1892; Boulder County, *Marie Holzinger*, August, 1892; mountains near Morrison, altitude 1,800 meters, *Bethel*, May, 1895, and October, 1897; South Table Mountain, near Golden, *Knowlton* 76, June 17, 1896.

NEW MEXICO: Socorro, *G. R. Vasey*, May, 1881.

2. **Aletes humilis** C. & R., sp. nov.

Cespitose, with peduncles much shorter than the leaves, 2 to 5 cm. long; petioles slender, longer than the blade; leaflets generally 5, entire to few-toothed, slightly scabrous on the margin, linear to obovate; rays 4 to 6, rather weak and spreading, 2.5 to 3 cm. long; pedicels very short; involucels of linear distinct bractlets; fruit ovate, 3 mm. long.

Type locality, Dale Creek, Larimer County, Colorado; collected by *George E. Osterhout*, no. 6, July 19, 1899; type in U. S. Nat. Herb.

Only known from type locality.

Mr. Osterhout also recognized this plant as a new species, but has kindly permitted us to publish it.

3. **Aletes (?) macdougali** C. & R., sp. nov.

With much the habit and foliage of *A. acaulis;* leaves narrow in outline, pinnate; leaflets few, ovate, few-toothed; peduncles longer than the leaves, 1 to 1.5 dm. high; rays 4 to 6, 5 to 10 mm. long; pedicels 2 to 3 mm. long; involucels of few linear distinct bractlets; flowers yellow; fruit (at least at first flattened laterally) narrowly oblong, 4 mm. long, the lateral ribs (and sometimes the others) becoming winged; seed nearly terete in cross section; oil tubes solitary in the intervals.

Type locality, on Berry's trail to the Grand Canyon of the Colorado, Arizona; collected by *D. T. MacDougal*, no. 192, June 28, 1898; type in U. S. Nat. Herb.

Only known from type locality.

This species differs from the other two in having the ribs sometimes (perhaps always) winged. The material, however, is too scanty to be positive as to its generic position.

4. **Aletes (?) davidsoni** C. & R., sp. nov.

Stems (and leaves) numerous, crowning more or less thickened elongated roots; short caulescent, 1 to 3 dm. high, much branched, glabrous; leaves ternate, the central lobe again ternate, all then pinnate; leaflets ovate in outline, 2 or 3-cleft into linear acute lobes, or the lower ones again cleft, while the upper ones sometimes become entire; peduncles 5 to 8 cm. long, glabrous except some puberulence at the top; rays few (6 to 10), nearly equal; pedicels 2 to 3 mm. long;

involucre none; involucel of several linear sometimes elongated bractlets; flowers deep purple; fruit oblong, 3 mm. long, flattened laterally, crowned by prominent calyx teeth; carpels more or less flattened dorsally, the lateral and sometimes the dorsal and intermediate ribs more or less winged; stylopodium none; oil tubes several in the intervals; seed face plane.

Type locality, near Coronado mine, Clifton, Ariz., among rocks in moist creek; collected by *A. Davidson*, no. 161, June 7, 1900; type in U. S. Nat. Herb.

Arizona.

Specimens examined:

ARIZONA: Type specimens as cited under type locality.

Flowering material of this species was sent by Mr. S. B. Parish in the winter of 1899–1900, but we were unable to determine it. Dr. A. Davidson, however, kindly consented to re-collect the species in fruiting condition. He has just sent in specimens, which enable us to characterize the species. We are unable, however, to decide with definiteness its generic relations. In habit it suggests *Pseudocymopterus montanus*, but the fruit is quite different. From typical *Aletes* it likewise seems different, but for the present there seems to be no better place for it.

5. **Aletes (?) tenuifolia** C. & R., sp. nov.

Stems glabrous, once to twice branching, slender and weak, usually longer than the leaves, 1 to 2 dm. long; leaves delicate, pinnate; leaflets 3 to 5, entire, filiform to linear, acute, 1 to 3 cm. long; rays very short (2 to 4 mm. long); fruit subsessile (the pedicels 1 mm. or less long); involucre wanting; involucels linear, entire, 3 to 6 mm. long; fruit oblong, 3 to 4 mm. long, slightly roughened; seed flattened slightly dorsally; carpels rather strongly 5-ribbed; oil tubes 2 or 3 in the intervals.

Type locality, near Logan, Utah; collected by *P. A. Rydberg*, August 9, 1895; type in New York Botanical Garden herbarium, fragments and photograph in U. S. National Herbarium.

Specimens examined: Type specimens as cited under type locality.

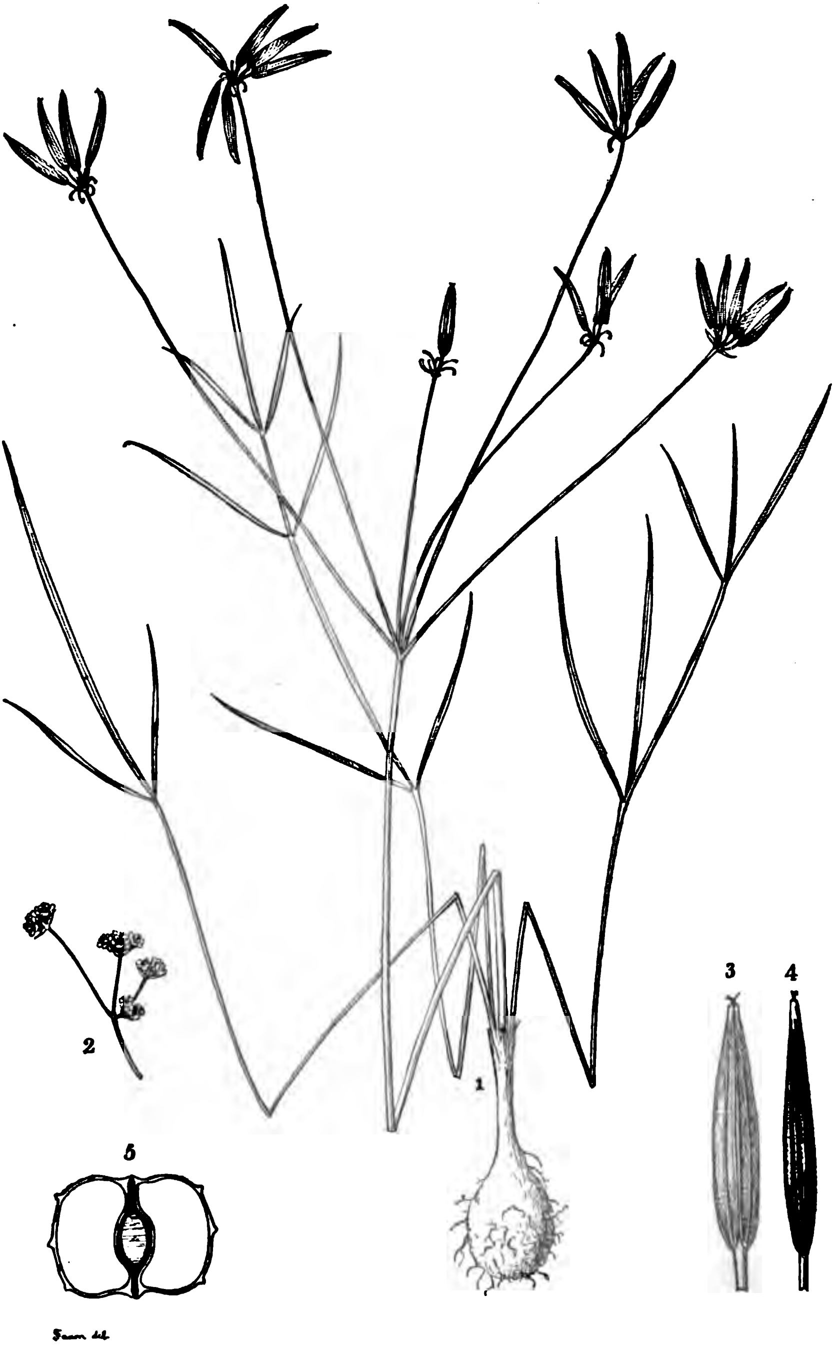
We are at loss just where to refer this species, and it is placed here only tentatively.

30. LEIBERGIA C. & R. Contr. Nat. Herb. 3: 575. 1896.

Calyx teeth obsolete. Fruit flattened laterally, linear, beaked, glabrous. Carpels only slightly flattened dorsally, with five filiform ribs, the two laterals a little more prominent and turned inward. Stylopodium wanting. Oil tubes small, single in the intervals, two on the commissural side. Seed face broad, slightly concave, but when dry becoming more or less involute.

Slender glabrous acaulescent plants from small globose tubers, with leaves ternately divided into long filiform leaflets, irregular umbels, subsessile fruit, and white flowers.

A monotypic genus of the Columbia River region.



Leibergia orogenioides C. & R.

1. **Leibergia orogenioides** C. & R. Contr. Nat. Herb. **3**: 575. pl. 27. 1896.
PLATE III.

Slender, 1.2 to 5 dm. high; leaves nearly as long as the flowering peduncle; leaflets 1 to 7.5 cm. long, entire or with few teeth or linear lobes; rays of the umbel 3 to 10, very slender, often spreading, very unequal, 2 to 12 cm. long; umbellets with few flowers and fruits; pedicels 2 mm. or less long; involucre wanting; involucels of 3 or 4 small bractlets somewhat united at base; fruit 8 mm. long, flattened laterally but terete at base, terete and somewhat beaked at apex.

Type locality, "Santianne Creek bottoms, Cœur d'Alene Mountains, Idaho, altitude 950 meters;" collected by *Leiberg*, no. 1027, June 24, 1895; type in U. S. Nat. Herb.

Wet ground, along streams, Idaho and Washington.

Specimens examined:

IDAHO: Type specimens, as cited under type locality.

WASHINGTON: Low, damp ground along streams, Spokane River, *Suksdorf* 1211, May 13, 1889.

EXPLANATION OF PLATE III.—Fig. *1*, plant; *2*, umbel; *3* and *4*, fruit; *5*, cross section of carpel.

We quote Mr. Leiberg's description of the plant in its habitat, as follows: "The plant, in the region where I collected it, occupies the same place in the flora of the heavily forested region of the lower white pine zone as do the tuberous-rooted, early flowering species of *Peucedanum* on the open plains of the Columbia, in Oregon, Washington, and Idaho; that is to say, it is an early flowering species, coming into bloom very soon after the snow leaves, preferring basaltic formations or soils derived from basaltic rocks. Wherever it grows it appears in such abundance that at the time of flowering it quite hides all other species."

31. **TAENIDIA** Drude in Engler & Prantl, Nat. Pflanzfam. **3**^{8}: 195. 1898.

Calyx teeth obsolete. Fruit flattened laterally, broadly oblong, glabrous. Carpel with equal filiform ribs. Stylopodium wanting. Oil tubes mostly 3 in the intervals, 4 on the commissural side. Seed nearly terete in section, with plane face.

Glabrous and glaucous perennials, with ternately compound leaves, usually no involucre or involucels, and yellow flowers.

A monotypic genus (based on *Smyrnium integerrimum* L.) of the Eastern United States and Canada.

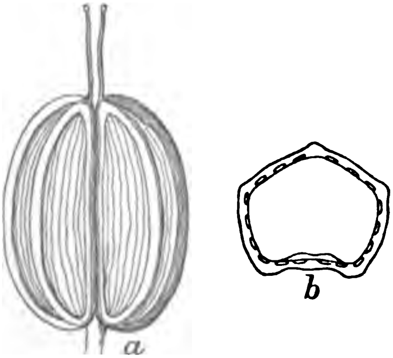


FIG. 29.—Taenidia integerrima: *a*, × 8; *b*, × 10.

1. **Taenidia integerrima** (L.) Drude, l. c. FIG. 29.

Smyrnium integerrimum L. Sp. Pl. **1**: 263. 1753.

Zizia integerrima DC. Mém. Soc. Phys. Genèv. **4**: 493. 1828.

Pimpinella integerrima Gray, Proc. Am. Acad. **7**: 345. 1868.

Glaucous, 3 to 9 dm. high, branching; leaves 2 to 3-ternately compound; leaflets lanceolate to ovate, entire; umbels 10 to 20-rayed; rays 5 to 8 cm. long; pedicels 8 to 12 mm. long; fruit broadly oblong, 4 mm. long.

Type locality, "Virginia."

From Canada to North Carolina, west to Minnesota and Arkansas.

Specimens examined:

ONTARIO: Sturgeon Point, *Scott*, August 1, 1891; Kingston, *Fowler*, July 10, 1893.

NEW YORK: Ithaca, *Pearce* (May 28, 1883), *Coville* (May 22, 1884), *Wiegand* (June–July, 1893).

PENNSYLVANIA: Near Lancaster, *Small*, May 14, 1891.

NEW JERSEY: Plainfield, *Tweedy*, May, 1879; Sussex County, *Pollard*, May 19, 1894; Guttenberg, *Van Sickle*, May 20, 1895.

MARYLAND: Glen Echo, *Pollard* 198, May 12, 1895.

DISTRICT OF COLUMBIA: Rock Creek, *Powell*, August 1, 1877.

VIRGINIA: Salt Pond Mountain, *Canby*, August, 1890.

NORTH CAROLINA: Summit of Table Rock Mountain, *Small & Heller* 280, July 2, 1891; near Biltmore, *Biltmore Herb.* 4350*a*, June 1, 1896.

TENNESSEE: French Broad River, *Kearney* 700, August 25, 1897; Knox County, *Ruth* 426, June, 1898.

WEST VIRGINIA: Upshur County, *Pollock*, May, 1895 and 1897.

OHIO: Lancaster, *Bigelow*; Niles, *Ingraham*, July, 1891; Lorain County, *Ricksecker*, May 14, 1892.

INDIANA: Crawfordsville, *Rose*, June 22, 1892.

MICHIGAN: Alma, *Davis*, August 28, 1891.

ILLINOIS: Near Chicago, *Babcock*; Naperville, *Umbach*, July 16, 1897.

MISSOURI: Jackson County, *Bush* 868, May 17, 1896.

IOWA: Fayette County, *Fink*, June–August, 1894.

MINNESOTA: Winona, *Holzinger*, July, 1889.

32. **EULOPHUS** Nutt. in DC. Coll. Mém. **5**: 69. 1829.

Podosciadium Gray, Proc. Am. Acad. **7**: 345. 1868.

Calyx teeth prominent. Fruit flattened laterally, ovate to linear-oblong, glabrous. Carpel with equal filiform ribs, and thin pericarp with a very small group of strengthening cells beneath each rib. Stylopodium conical, with long and recurved styles. Oil tubes 1 to 5 in the intervals, 4 to 8 on the commissural side, and a small group in the parenchyma of the commissural sulcus. Seed face broadly concave, with a central longitudinal ridge.

Glabrous perennials 3 to 15 dm. high, from deep-seated fascicled tubers, with pinnately or ternately compound leaves, narrowly linear to oblong-linear mostly entire leaflets (or segments), the terminal one elongated, involucre (rarely wanting) and involucels of several lanceolate acuminate usually subcarious bracts, and long-peduncled umbels of white or pinkish flowers.

Type species, *Eulophus americanus* Nutt.

A genus of 6 species, belonging to the United States.

Oil tubes several in the intervals.

Involucels of small setaceous bractlets.

Petioles and rachis not enlarged.
  Fruit larger (4 to 6 mm.); Eastern .... 1. *E. americanus.*
  Fruit smaller (3 to 4 mm.); Californian .... 2. *E. parishii.*
Petiole and rachis broad and inflated.
  Leaflets narrowly linear to filiform .... 3. *E. pringlei.*
  Leaflets linear-lanceolate .... 4. *E. simplex.*
Involucels of large bractlets longer than the pedicels .... 5. *E. bolanderi.*
Oil tubes solitary in the intervals .... 6. *E. californicus.*

1. **Eulophus americanus** Nutt. in DC. Coll. Mém. **5**: 69. pl. 2. fig. m. 1829. FIG. 30.

Erect, 9 to 15 dm. high; basal and lower cauline leaves large, once or twice pinnately compound, with leaflets cut into short narrow segments; upper cauline leaves ternate, with narrowly linear elongated leaflets (2.5 to 5 cm. long, 3 mm. wide); umbel 10 to 12-rayed, with involucre scanty or none, and involucels of numerous linear bractlets (tapering from the bottom) 2 to 3 mm. long; fruit ovate or oblong, 4 to 6 mm. long, 3 to 4 mm. broad, with ribs almost obsolete; oil tubes mostly 3 in the intervals, 4 on the commissural side.

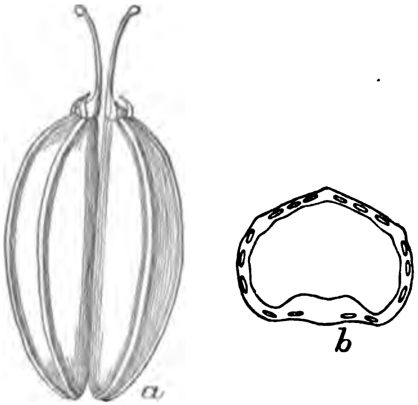


FIG. 30.—Eulophus americanus: *a*, × 8; *b*, × 10.

Type locality, "la territoire de l'Arkansa;" collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Columbia Univ. and Herb. Philad. Acad.

Ohio to Missouri, south to Tennessee and Arkansas.

Specimens examined:

ILLINOIS: Near Athens, *Hall*, July, 1861; Riverside, near Chicago, *Babcock*, July 8, 1871; Naperville, *Umbach*, June 28, 1897.

MISSOURI: Jefferson County, *Hasse*, June, 1887; Shannon County, *Bush* 47, August 1889, and 1890; Washington County, *Martone*, July, 1893; Eagle Rock, *Bush* 76, 185, May–June, 1897 and 1898; Swan, *Bush* 213, June 8, 1898.

2. **Eulophus parishii** C. & R. Rev. N. Am. Umbell. 112. 1888.

Pimpinella parishii C. & R. Bot. Gaz. **12**: 157. 1887.

Slender, 2 to 9 dm. high; leaves ternate (rarely biternate), on petioles 5 to 13 cm. long (the whole leaf, including the petiole, sometimes becoming 3 dm. long), with narrowly linear (almost filiform) to narrowly lanceolate leaflets 2.5 to 7.5 cm. long, 1 to 10 mm. wide, terminal leaflet (sometimes 12.5 cm. long) more or less distant; uppermost leaves simple and bract-like; umbel 8 to 10-rayed, with scanty involucre or none, and involucels of 2 to 6 narrowly lanceolate bractlets 4 mm. long; rays 1 to 2.5 cm. long; pedicels 4 to 8 mm. long; fruit ovate or oblong, 2 to 4 mm. long, 1 to 2 mm. broad; oil tubes 2 to 4 in the intervals, 6 on the commissural side.

Type locality, "damp meadows, Bear Valley, San Bernardino Mountains, California;" collected by *S. B. & W. F. Parish*, no. 987, August, 1882; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

In southern California, from Fresno County southward.

Specimens examined:

CALIFORNIA: Near San Diego, *Palmer*, in 1875; Cuyamaca Mountains, San Diego County, *Orcutt* 10, July, 1889; type specimens as cited under type locality; Fresno County, *Coville & Funston* 1846, August 3, 1891; type locality, altitude 1,950 meters, *Parish* 3171, June 24, 1894; San Jacinto Mountains, altitude 2,400 meters, *Hall* 851, August 5, 1897.

Eulophus parishii rusbyi C. & R. Bot. Gaz. **14**: 281. 1889.

Leaflets filiform to linear, sometimes becoming 15 cm. long; fruit larger, about 4 mm. long and 3 mm. broad.

Type locality, "Bill Williams Mountain," Arizona; collected by *Rusby*, no. 629, July 11, 1883; type in U. S. Nat. Herb.

Mountains of northern Arizona.

Specimens examined:

ARIZONA: Type specimens as cited under type locality; Flagstaff, *Lemmon* 60, June, 1884.

3. **Eulophus pringlei** C. & R. Rev. N. Am. Umbell. 113. 1888.

Erect, 3 to 6 dm. high; leaves pinnately compound, with broad inflated midrib and distinct divisions, which are cut into a few narrowly linear almost filiform segments; umbel 3 to 8-rayed, with scanty involucre, and involucels of numerous subscarious lanceolate bractlets about a third as long as the pedicels (sometimes nearly as long); rays about 5 cm. long; pedicels 6 to 12 mm. long; fruit oblong, 4 to 5 mm. long, about 1 mm. broad; oil tubes 3 to 5 in the intervals, 8 on the commissural side.

Type locality, in "California;" collected by *Pringle*, no. 40, in 1882; type in Herb. Gray.

Southern California.

Specimens examined:

CALIFORNIA: San Luis Obispo, *Jones* 3230, May 6, 1882; Chalcedon Hill, San Luis Obispo County, *Mrs. R. W. Summers*, in 1889; Kern River Valley, Kern County, altitude 900 to 1,450 meters, *Coville & Funston* 1050, June 23, 1891; near Acton, San Bernardino Mountains, Los Angeles County, *Hasse*, May 21, 1893.

4. **Eulophus simplex** C. & R.

? Carum gairdneri latifolium Gray, Proc. Am. Acad. **7**: 344. 1867.
E. pringlei simplex C. & R. Rev. N. Am. Umbell. 113. 1888.

Stems nearly simple, erect, glabrous; basal leaves on elongated peduncles; leaflets 3, elongated linear to lanceolate, 7 to 12 cm. long; involucels of scarious lanceolate bractlets usually shorter than the slender pedicels; fruit oblong (immature); stylopodium conical; style slender; calyx teeth prominent.

Type locality, "Sierra County, Cal.;" collected by *Lemmon* in 1874.

Specimens examined:

CALIFORNIA: Ebbets Pass, *Brewer* 2030, in 1863.

NEVADA: Near Carson City, in 1864.

Unfortunately we have not been able to locate the type of this species, and therefore we could not reexamine its characters. It seems hardly possible that it could be a variety of *E. pringlei*. It is very likely the same as *Carum gairdneri latifolium*, which is undoubtedly a *Eulophus*. The description above is drawn wholly from the type specimens of *Carum gairdneri latifolium*.

5. **Eulophus bolanderi** (Gray) C. & R. Rev. N. Am. Umbell. 112. 1888.

Podosciadium bolanderi Gray, Proc. Am. Acad. 7: 346. 1868.

Erect, 6 dm. high; leaf divisions more or less pinnately compound; ultimate segments narrowly linear, 1 to 3 cm. long (terminal one sometimes 7.5 cm.), 0.5 to 2 mm. wide (lateral leaflets sometimes much reduced and toothed); uppermost leaves simple; umbel 10 to 25-rayed, with prominent involucre, and involucels of scarious ovate-lanceolate abruptly long-acuminate bractlets longer than the pedicels; rays 10 to 20 mm. long; pedicels 3 to 4 mm. long; fruit oblong, 3 mm. long, 1 mm. broad; oil tubes small, 2 to 5 in the intervals, 6 on the commissural side; seed more dorsally flattened than in any other species.

Type locality, "Mariposa Trail, Yosemite," California; collected by *Bolander;* type in Herb. Gray.

California and Oregon, eastward to Utah and Idaho.

Specimens examined:

CALIFORNIA: *Bolander*, in 1873; Sierra Valley, Sierra County, *Lemmon*, August, 1874 and 1875; Emigrant Gap, *Jones* 3603, June 28, 1882; in the region of Mount Whitney, altitude 2,100 to 2,400 meters, *Katharine Brandegee;* Colby, Butte County, *R. M. Austin* 256, July, 1896; Pah Ute Peak, southeastern California, altitude 1,200 to 1,500 meters, *Purpus* 5293, April–September, 1897.

OREGON: *Cusick* 1097, May, 1883; Steins Mountain, *Howell*, June 1, 1885; Malheur Butte, Malheur County, altitude 720 meters, *Leiberg* 2027, May 12, 1896; Otis Creek, Malheur County, altitude 1,100 meters, *Leiberg* 2335, June 20, 1896; near Harney, Blue Mountains, *Coville* 524, July 10, 1896; hillsides near Snake River, *Cusick* 1916, June 2, 1898.

IDAHO: *Wilcox*, in 1883; Long Valley, altitude 1,200 meters, *Henderson* 3181, July 6, 1895; Salubria, Cuddy Mountains, Indian Valley, and Payette Lake, *Jones*, July 10–25, 1899.

UTAH: East Humboldt Mountains, altitude 2,100 meters, *Watson* 442, July, 1869.

NEVADA: Geiger Grade, *Katharine Brandegee*, July, 1884; near Verde, Washoe County, *Sonne*, June, 1890 and 1895.

6. **Eulophus californicus** (Torr.) C. & R. Rev. N. Am. Umbell. 114. 1888.

Chaerophyllum (?) *californicum* Torr. Pacif. R. Rep. 4[1]: 93. 1856.

Podosciadium californicum Gray, Proc. Am. Acad. 7: 346. 1868.

Erect, 9 to 12 dm. high; leaf divisions pinnately compound; segments linear, 1 to 2.5 cm. long, 2 to 3 mm. broad, terminal one elongated (5 to 13 cm. long); uppermost leaves simple; umbel 9 to 12-rayed, with prominent involucre, and involucels of numerous scarious lanceolate long-acuminate bractlets 6 mm. long; rays 5 cm. long; pedicels 16 to 20 mm. long; fruit linear-oblong, 8 mm. long, 3 mm. broad; oil tubes large, solitary in the intervals, 4 on the commissural side; sulcus of seed face deeper than in other species, and with more prominent central ridge.

Type locality, "wet ravines, Knights Ferry, Stanislaus County," California; collected by *Bigelow*, May 8, 1854; type in Herb. Gray.

Central California.

Specimens examined:

CALIFORNIA: Mendocino County, *G. R. Vasey*, in 1875; Santa Lucia Mountains, *G. R. Vasey* 227, July, 1880; *Greene*.

33. SIUM L. Sp. Pl. 1: 251. 1753.

Calyx teeth minute. Fruit flattened laterally, ovate to oblong, glabrous. Carpel with prominent corky nearly equal ribs, each with a prominent group of strengthening cells at tip. Stylopodium depressed; styles short. Oil tubes 1 to 3 in the intervals (never solitary in all the intervals), 2 to 6 on the commissural side. Seed subangular, with plane face.

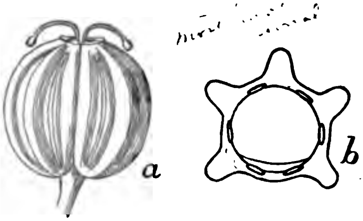


FIG. 31.—Sium cicutaefolium: *a*, *b*, × 12.

Smooth perennials growing in water or wet places, with pinnate leaves and serrate or pinnatifid leaflets, involucre and involucels of numerous narrow bracts, and white flowers.

First species cited, *Sium latifolium* L.

A genus of about 10 species, belonging to the north temperate regions of both hemispheres, and also in South Africa.

Stout and tall; leaflets narrow; fruit larger (3 mm. long) .... 1. *S. cicutaefolium.*
Weak and lower; submerged or floating leaves broad; fruit smaller (2 mm. long). 2. *S. carsonii.*

1. **Sium cicutaefolium** Gmelin, Syst. 2: 482. 1791. FIG. 31.

Sium lineare Michx. Fl. Bor. Am. 1: 167. 1803.

Stout, 6 to 8 dm. high; leaflets 3 to 8 pairs, linear to lanceolate, sharply serrate and mostly acuminate, 5 to 13 cm. long (lower leaves sometimes submersed and finely dissected, as in the next); umbel many-rayed; rays 2.5 to 4 cm. long; pedicels 2 to 6 mm. long; fruit 3 mm. long, with prominent ribs; oil tubes 2 to 6 on the commissural side.

Type locality unknown to us.

In swamps from Newfoundland to Virginia, west to British Columbia and northern California. We have no specimens from the southern belt of the United States.

Specimens examined: We cite but few of the very numerous specimens of this common and widely distributed species.

NEWFOUNDLAND: Whitbourne, *Robinson & Schrenk* 212, October 15, 1894.
VERMONT: Barnet, *Blanchard*, August 25, 1884.
MASSACHUSETTS: West Quincy, *Deane*, June 28, 1890.
CONNECTICUT: Bridgeport, *Eames*, May 2, 1895.
NEW YORK: Ithaca, *Coville*, August 20, 1885.
PENNSYLVANIA: Harrisburg, *Small*, July 28, 1888.
DISTRICT OF COLUMBIA: Great Falls of the Potomac, *Pollard* 107, April 27, 1895.
VIRGINIA: Smyth County, *Small*, July 25, 1892.
OHIO: Lorain County, *Ricksecker*, August 10, 1894.
INDIANA: Lake County, *Umbach*, August 20, 1898.
MICHIGAN: Near Agricultural College, *Wheeler*, in 1892.
WISCONSIN: Camp Douglas, *Mearns*, August 3, 1891.
MISSOURI: Jackson County, *Bush* 252, August 22, 1896.
IOWA: Fayette County, *Fink* 419, August, 1894.
MINNESOTA: Fort Snelling, *Mearns*, September 1, 1891.
SOUTH DAKOTA: Brookings, *Thornber*, August 25, 1893.
NEBRASKA: Grant County, *Rydberg* 1615, July 3, 1893.
COLORADO: San Luis Valley, *Wolf* 730, September, 1873.
WYOMING: Yellowstone Park, *Rydberg* 4601, August 3, 1897; Laramie River, Albany County, *Nelson* 4281, September 15, 1897; Jacksons Lake, *A. & E. Nelson* 6551, August 18, 1899.
MONTANA: Great Falls, *Williams* 374, July 22, 1886; East Gallatin, *Flodman* 685, July 24, 1896.
IDAHO: Lake Pend Oreille, *Leiberg* 637, August, 1891; Mud Lake, Kootenai County, *Sandberg* 733, July 25, 1892.
UTAH: Ogden, *Tracy* 483, August 4, 1887; Marysvale, *Jones* 5974, September 1, 1894.
NEVADA: Ruby Valley, *Watson* 443, July, 1868.
CALIFORNIA: Siskiyou and Plumas counties, *Brown*, July–August, 1897.
OREGON: Crook County, *Leiberg* 828, August 27, 1894; Drews Valley, *Coville & Leiberg* 157, August 2, 1896.
WASHINGTON: Seattle, *Piper*, August, 1888.
BRITISH COLUMBIA: Near Westminster, *Macoun* 302, August 28, 1893; near Lake Shawnigan, Vancouver Island, *Canby* 94, August 16, 1897.
GREAT SLAVE LAKE: *Kennicott*, in 1861–62.

2. **Sium carsonii** Durand, in Gray's Man. ed. 5. 196. 1867.

Weak, 3 to 6 dm. high; leaflets 1 to 6 pairs, linear to lanceolate, sharply serrate, 2.5 to 5 cm. long; when submersed or floating very thin, ovate to oblong, usually laciniate-toothed or dissected, the leaf sometimes reduced to the terminal leaflet; umbel fewer (10 to 15)-rayed; rays about 2.5 cm. long; pedicels 2 to 6 mm. long; fruit smaller, about 2 mm. long, with less prominent ribs; oil tubes 2 to 4 on the commissural side.

Type locality, "Pennsylvania, around the Pocono Mountain."

In streams, Maine to Pennsylvania; also in Minnesota.

Specimens examined:

MASSACHUSETTS: Ashland, *Wheeler*, July, 1883.
CONNECTICUT: Trumbull, *Eames*, September 2, 1895.

PENNSYLVANIA: Pocono Mountains, Monroe County, *Traill Green*, July 16, 1857; same station, *Britton*, July 26, 1893.
MINNESOTA: Near Minneapolis, *Sandberg*, September 17, 1891.

3. **Sium heterophyllum** Greene, Pittonia **2**: 102. 1890.

"Roots fusiform-thickened below the middle; stem stout, notably angular and flexuous, 3 feet high; lowest leaves with a simple lamina which is rather broadly rhombic-lanceolate, serrate, or laciniate-cleft, and 2 to 10 inches long, supported on a stout fistulous petiole; the later radical 3-lobed or divided and passing to the truly pinnate, which have but 2 pairs of broadly lanceolate acute serrate leaflets; the bracts of the involucre broadly lanceolate, tapering at both ends; fruit 1½ lines long, strongly ribbed."

Type locality, "brackish marshes near Suisun, California," where it is associated with *Cicuta bolanderi.*

"It is always aquatic, and as compared with *S. cicutaefolium*, in which the lowest leaves are the most dissected, reverses the order of leaf development." We have not seen this plant.

34. **BERULA** Hoffm. in Bess. Enum. Pl. Volh. 44. 1821.

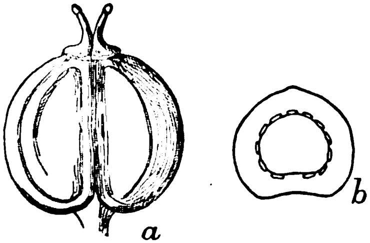


FIG. 32.—Berula erecta: *a*, *b*, × 10.

Calyx teeth minute. Fruit flattened laterally, nearly round, emarginate at base, glabrous. Carpel nearly globose, with very slender inconspicuous ribs, thick corky pericarp, and no strengthening cells. Stylopodium conical. Oil tubes numerous and contiguous, closely surrounding the seed cavity. Seed terete.

Smooth aquatic perennial, with simply pinnate leaves and variously cut leaflets, usually conspicuous involucre and involucels of narrow bracts, and white flowers.

A monotypic genus based on *Sium erectum* Huds. of the north temperate regions of both hemispheres.

1. **Berula erecta** (Huds.) Coville, Contr. Nat. Herb. **4**:115. 1893. FIG. 32.

Sium erectum Huds. Fl. Angl. 103. 1762.
Sium angustifolium L. Sp. Pl. ed. 2. **2**:1672. 1763.
Berula angustifolia Mert. & Koch, Deutsch. Fl. **2**:433. 1826.

Erect, 1.5 to 9 dm. high or even smaller; leaflets 5 to 9 pairs, linear to oblong or ovate, serrate to cut-toothed, often laciniately lobed, sometimes crenate, 1 to 7.5 cm. long; umbel many-rayed; rays 5 cm. long or less; pedicels 4 to 6 mm. long; fruit scarcely 2 mm. long.

Type locality not given.

In swamps and streams, Ontario to Texas, westward to British Columbia and California, and extending into Mexico.

Specimens examined:

Illinois: *F. Peck.*

Minnesota: Fort Snelling, *Mearns*, September 13, 1891.

South Dakota: Black Hills, near Fort Meade, *Forwood* 141, August 5, 1887; Big Stone, Grant County, *Williams*, August 23, 1892; Black Hills, Hot Springs, *Rydberg* 722, August 10, 1892.

Nebraska: Paddock, *Clements* 2802, July 29, 1893.

Kansas: Reno County, *Carleton* 294, July 10, 1891; Rockport, *Bartholomew*, August 3, 1891.

Texas: *Wright* 1105, in 1851–52; *Mex. Bound. Surv.;* San Antonio, *Havard.*

New Mexico: Silver City, *Snow*, August; White Mountains, Lincoln County, *Wooton* 256, July 31, 1897.

Colorado: San Luis Valley, *Wolf* 732, September, 1873; near Denver, *Letterman* 217, August 20, 1884; near Fort Collins, *Cowen*, July–August, 1893 and 1895.

Wyoming: Yellowstone Park, *Forwood*, August 3, 1881; Little Goose Creek, *A. Nelson* 2275, July 11, 1896; Badger, *A. Nelson* 2766, August 27, 1896.

Montana: Great Falls, *Williams* 193, September 27, 1885.

Utah: Near Glenwood, *Ward* 303, July 3, 1875; Rabbit Valley, *Ward* 595, August 17, 1875; Salt Lake City, *Tracy* 662, August 11, 1887; Provo, *Jones* 5618*a*, July 11, 1894.

Arizona: Santa Cruz River, *Smart* 373, in 1867; *Palmer*, in 1869; Bakers Butte, *Toumey* 189, July 19, 1892; Fort Apache, *Shuttleworth*, June 29.

Nevada: Humboldt Pass, *Watson* 444, September, 1868.

California: Near Fort Tejon, *Xantus de Vesey* 37, in 1857–58; same station, *Rothrock* 262, August, 1875; near Los Angeles, *Tracy* 396, July 6, 1887; Inyo County, *Coville & Funston* 271, February 7, 1891.

Oregon: Otis Creek, Malheur County, *Leiberg* 2341, June 20, 1896; Wallowa Valley, *Cusick* 2081, August 19, 1898.

Washington: Coulee City and Wilbur, *Henderson* 2525, July 11, 1892.

British Columbia: Kamloops, *Macoun* 20, June 17, 1889.

35. **PTILIMNIUM** Raf. Am. Month. 4: 192. 1819.

Discopleura DC. Coll. Mém. 5: 38. 1829.

Calyx teeth small or somewhat prominent. Fruit flattened laterally, ovate or oblong, glabrous. Carpel with dorsal and intermediate ribs filiform to broad and obtuse; the laterals very thick and corky, closely contiguous to those of the other carpel, forming a dilated obtuse or acute corky band (except in *P. nuttallii*); all subtended by strengthening cells. Stylopodium conical and prominent, with very short to somewhat elongated styles. Oil tubes solitary in the intervals, 2 on the commissural side. Seed nearly terete (somewhat sulcate beneath the oil tubes) or with flattish face.

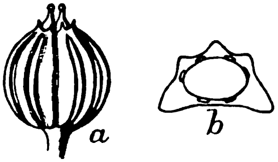


Fig. 33.—Ptilimnium capillaceum: *a*, × 8; *b*, × 10.

Smooth branching annuals, with finely dissected leaves (filiform or lanceolate divisions), involucre of foliaceous bracts, involucels of prominent or minute bractlets, and white flowers.

Type species, *Ammi capillaceum* Michx. Fl. Bor. Am. **1**: 164. 1803.

A genus of at least 3 species, belonging to Eastern United States.

Leaves dissected into filiform divisions.
  Involucral bracts cleft or parted; fruit 2 to 3 mm. long.......... 1. *P. capillaceum.*
  Involucral bracts entire; fruit 1 to 1.5 mm. long.................... 2. *P. nuttallii.*
Leaves with lanceolate divisions; fruit large (4 mm. long)........ 3. *P. laciniatum.*

1. **Ptilimnium capillaceum** (Michx.) Raf. Seringe Bull. Bot. 217. 1830.

FIG. 33.

Ammi capillaceum Michx. Fl. Bor. Am. **1**: 164. 1803.
Discopleura capillacea DC. Coll. Mém. **5**: 38. pl. 8. 1829.

Slender and more or less spreading, 3 to 6 dm. high; leaves finely dissected into filiform divisions; umbel 5 to 20-rayed, with involucre of filiform bracts usually cleft or parted, and involucels more or less prominent; rays 0.5 to 3 cm. long; pedicels 3 to 6 mm. long; fruit ovate, 2 to 3 mm. long, with filiform dorsal and intermediate ribs, the laterals forming a broad flat band about the fruit; calyx teeth minute; styles shorter than the stylopodium, sometimes very short; seed face convex.

Type locality, "in campestribus Carolinae."

Wet meadows, mostly near the coast, from Massachusetts to Florida and west to Texas.

Specimens examined:

MASSACHUSETTS: Nantucket, *Miss F. N. Vasey*, August 12, 1897.
CONNECTICUT: Stratford, *Eames*, August 16, 1893.
NEW YORK: Staten Island, *Small*, July 12, 1889.
NEW JERSEY: Woodridge, *Nash* 43, July, 1889; Port Morris, *Holmes* 385, September 9, 1890.
DELAWARE: Kent County, *Holmes* 144, August, 1890.
MARYLAND: Eastern Maryland, *Holmes* 44, July, 1890.
DISTRICT OF COLUMBIA: Near Washington, *Ward*, in 1877.
VIRGINIA: Franklin, Southampton County, *Heller* 1150, July 22–29, 1893; Walnut Point, *Knowlton*, August 17, 1897.
NORTH CAROLINA: *McCarthy*, July, 1885; near Wilmington, *Coville*, June 24, 1890; Rowan County, *Small & Heller* 65, August 13–18, 1891; southeastern North Carolina, *Ashe*.
SOUTH CAROLINA: Aiken, *Ravenel*, July, 1869.
FLORIDA: Near Jacksonville, *Curtiss* 1028, and 4341, 4918, June–July, 1893, 1894; near Eustis, Lake County, *Nash* 837, May 16–31, 1894, and 1930, May 28–June 15, 1895; *Biltmore Herb.* (Chapman coll.) 2161.
ALABAMA: Auburn, Lee County, *Pollard & Maxon* 57, July 9, 1900.
MISSISSIPPI: Madison, *Phares*, in 1883; Ocean Springs, *Miss K. Skeehan*, June 15, 1890.
TEXAS: Hempstead, *Hall* 247, June 12, 1872.

The following forms differ in certain respects from *P. capillaceum* as defined above and may or may not deserve recognition as varieties or species. Field study and a fuller supply of fruiting specimens will be necessary to settle the question.

A form from Allenton, Mo. (*Letterman*, August 27, 1878), has the cleft involucral bracts, fruit ribs, and larger fruit of *P. capillaceum*, and the stouter habit, more prominent stylopodium, longer styles, and range of *P. nuttallii*.

A form from near Hockley, Tex. (*Thurow*, September, 1890), has the cleft involucral bracts, fruit ribs, and shorter styles of *P. capillaceum*, and the stouter habit, smaller fruit, and larger calyx teeth of *P. nuttallii*.

A form collected in swamps near Wilmington, N. C. (*McCarthy*, July-August, 1885), probably represents *Ammi costatum* Ell. Sketch **1**: 350, 1821 (*Discopleura capillacea costata* DC. Coll. Mém. **5**: 39. pl. 8. fig. B. 1829, and *D. costata* Chap. Manual 162. 1860). It is a much stouter plant, reported to become 12 to 15 dm. high; the leaf segments are very numerous and crowded and appear verticillate. The absence of fruit, however, prevents us from examining the more essential characters. Elliott's statement that *P. capillaceum* is a low and spreading vernal plant, while his *Ammi costatum* is a tall and erect autumnal plant, furnishes good characters, if tenable. Our specimens of both, however, show nothing strikingly different in the spreading or erect habit, or in season; and in the absence of fruit we have nothing but size to distinguish the two forms. The figure of the fruit of *costata* given by De Candolle does not suggest any material difference from *P. capillaceum*.

2. **Ptilimnium nuttallii** (DC.) Britton, Mem. Torr. Club **5**: 244. 1894.

Discopleura nuttallii DC. Coll. Mém. **5**: 38. pl. 9. 1829.
Discopleura capillacea nuttallii C. & R. Bot. Gaz. **12**: 292. 1887.

Resembles *P. capillaceum*, but stouter, 6 to 9 dm. high; rays more numerous; involucral bracts entire, and involucels of smaller bractlets; fruit ovate, 1 to 1.5 mm. long, somewhat constricted beneath the more prominent calyx teeth; stylopodium more prominent, and styles longer and recurved; dorsal and intermediate ribs more prominent, nearly equaling the laterals, which are distinct and do not form a broad flat band.

Type locality, "in North America at Red River;" collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Philad. Acad.

In swamps, from southern Illinois to Alabama and Texas.

Specimens examined:

Illinois: Jackson County, *French*, July 11, 1878.
Missouri: Allenton, *Letterman*, in 1881.
Arkansas: Fort Smith, *Bigelow*, in 1853–54; near Little Rock, *Mrs. M. H. Taft*, in 1888.
Alabama: Northern Alabama, *G. R. Vasey*, in 1878.
Indian Territory: *Palmer* 149, in 1868; *Sheldon*, June 13, 1891.
Texas: Hempstead, *Hall* 243, June 16, 1872; Sherman, *Mrs. M. L. Nash*, in 1888; Fort Worth, *Dewey*, June 8, 1891.

3. **Ptilimnium laciniatum** (Engelm. & Gray) Kuntze, Rev. Gen. Pl. **1**: 269. 1891.

Daucosma laciniatum Engelm. & Gray, Bost. Jour. Nat. Hist. **6**: 211. 1850. (Pl. Lindh.)

Erect, 6 to 9 dm. high; leaves dissected into lanceolate divisions, or the uppermost linear-setaceous; umbel nearly equally many-rayed with involucre and involucels of numerous 3 to 5-parted setaceous bracts; rays 1 to 3 cm. long; pedicels 4 to 6 mm. long; fruit oblong, about 4 mm. long, with broad and flattish dorsal and intermediate ribs, the laterals forming a prominent acute ridge about the fruit; calyx teeth small; styles recurved, longer than the stylopodium; seed face plane.

Type locality, "high valleys near New Braunfels and on the Upper

Guadaloupe, Texas, covering large patches of moist prairie land, and along the margin of thickets;" collected by *Lindheimer*, in 1845–46; type in Herb. Gray.

Moist meadows, western Texas.

Specimens examined:

TEXAS: *Lindheimer* 404, in 1846; along the Nueces River, *Wright* 232, in 1849; Pedregal Creek, *Wright* 1385, in 1852; Gillespie County, *Jermy* 457, 712; Kerr County, *Heller* 1943, June 26–30, 1894.

36. CYNOSCIADIUM DC. Coll. Mém. 5: 44. 1829.

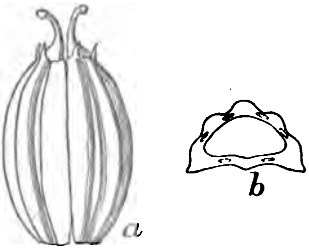


FIG. 34.—Cynosciadium pinnatum: *a*, × 8; *b*, × 10.

Calyx teeth persistent. Fruit flattened laterally, ovate to oblong, glabrous. Carpel with prominent ribs, laterals much the largest, forming a broad corky margin (except *C. pinnatum*); a large group of strengthening cells in each rib. Stylopodium conical. Oil tubes solitary in the intervals, 2 on the commissural side. Seed somewhat flattened dorsally, with plane face.

Glabrous annuals, with digitately or pinnately divided cauline leaves (leaflets linear to narrowly lanceolate), mostly undivided lower and basal leaves, involucre and involucels of linear bracts, and white flowers.

First species cited, *Cynosciadium digitatum* DC.

A genus of 3 species, belonging to the south central United States.

Cauline leaves digitate; fruit beaked .... 1. *C. digitatum.*
Leaves pinnate; fruit not beaked.
  Fruit with nearly equal ribs; the small calyx teeth inserted some distance below the base of the very prominent stylopodia ... 2. *C. pinnatum.*
  Fruit with lateral ribs much the largest; the much larger calyx teeth inserted near the base of the less prominent stylopodia . 3. *C. pumi'um.*

1. **Cynosciadium digitatum** DC. Coll. Mém. 5: 45. pl. 11. fig. A. 1829.

Slender, 3 to 6 dm. high; basal leaves linear-lanceolate, entire; cauline leaves palmately 3 to 5-parted; umbels irregular, mostly 3 to 8-rayed; rays about 2.5 cm. long; pedicels very unequal, 6 to 20 mm. long; fruit ovate, 2 mm. long, contracted into a beak at summit; dorsal and intermediate ribs narrow, laterals broad and corky; calyx teeth minute, much shorter than the stylopodium.

Type locality, "aux environs du fleuve Arkansa;" collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Philad. Acad.

Wet ground, Arkansas to Alabama and eastern Texas.

Specimens examined:

ARKANSAS: Near Little Rock, *Coville* 49, July 9, 1887.

TEXAS: Near Hempstead, *Hall* 255, June 10, 1872; Colorado County, *Joor*, May 27, 1876; near Dallas, *Reverchon*, in 1877, 1879, 1881.

MISSISSIPPI: Meridian, *Tracy* 3262, in 1897.

2. **Cynosciadium pinnatum** DC. Coll. Mém. 5: 45. pl. 11. fig. B. 1829. FIG. 34.

Slender, 3 to 6 dm. high; cauline leaves pinnately divided into few distant segments, terminal one much the largest; basal leaves similar or often entire; umbels 5 to 10-rayed; rays 1 to 1.5 cm. long; pedicels 2 to 8 mm. long; fruit oblong, 3 mm. long, not beaked at summit; ribs nearly equal (dorsal and intermediates more prominent and laterals less so than in *C. digitatum*); calyx teeth more prominent than in *C. digitatum*, but shorter than the prominent stylopodium and inserted some distance below its base.

Type locality, "aux environs du fleuve Arkansa;" collected by *Nuttall;* type in Herb. DC., duplicate in Herb. Philad. Acad.

From southern Missouri and southern Kansas to eastern Texas.

Specimens examined:
MISSOURI: McDonald County, *Bush*, July–August, 1892 and 1893.
KANSAS: Cowley County, *White*, August, 1898.
OKLAHOMA: Perkins, *Waugh* 41, June 14, 1893.
TEXAS: Hockley County, *Thurow*, in 1889; *Nealley* 157, in 1890 and 1892.

3. **Cynosciadium pumilum** (Engelm. & Gray) C. & R.

Cynosciadium pinnatum pumilum Engelm. & Gray, Bost. Jour. Nat. Hist. 5: 218. 1845 (Pl. Lindh.).

Low and diffuse; leaves as in *C. pinnatum;* rays 3 to 6; fruit short oblong to orbicular, 2 to 3 mm. long; ribs as in *C. digitatum;* calyx teeth much more prominent than in *C. pinnatum*, and inserted near the base of the much less prominent stylopodia.

Type locality, "prairies, Galveston," Tex.; collected by *Lindheimer;* type in Herb. Gray.

Specimens examined:
TEXAS: Houston, *Hall* 254, April 16, 1872; Hempstead, *Hall* 253, June 8, 1872; Harris County, *Joor*, April 17, 1875; Hockley County, *Thurow*, in 1889; Corpus Christi, Nueces County, *Heller* 1409, March 5–12, 1894; Industry, *Wurzlow*, in 1895; near Houston, *Rose* 4188, May 6, 1899.

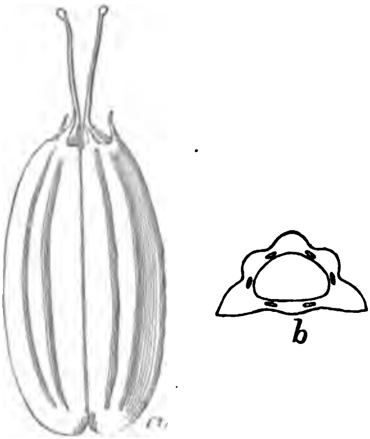


FIG. 35.—Oenanthe sarmentosa californica: *a, b*, × 10.

37. OENANTHE L. Sp. Pl. 1: 254. 1753.

Calyx teeth rather prominent. Fruit globose, slightly flattened laterally if at all, glabrous. Carpel (section about semiterete) with broad obtuse corky ribs; laterals the largest; a band of strengthening cells investing seed and oil tubes. Stylopodium very short-conical, with elongated styles. Oil tubes solitary in the intervals, 2 on the commissural side. Seed sulcate beneath each oil tube (commissural as well as dorsal).

Mostly aquatic glabrous herbs, with succulent stems, pinnate or decompound leaves, and usually involucrate umbels of white flowers.

First species cited, *Oenanthe fistulosa* L.

A genus of about 30 species, all of which belong to the Eastern Hemisphere excepting the following Pacific coast species and a Mexican species.

1. **Oenanthe sarmentosa** Presl., in DC. Prodr. 4: 138. 1830.

FIG. 35.

Succulent stems 6 to 15 dm. high; leaves ternate and bipinnate; leaflets ovate, acuminate, toothed, often lobed at base, 1 to 2.5 cm. long; umbels many-rayed, with involucre of a few linear bracts or none, and involucels of similar more numerous bractlets; rays 2.5 cm. long or less; pedicels numerous, short; fruit about 4 mm. long, with commissural face (as well as ribs) very corky.

Type locality, "Nootka Sound," Vancouver Island; collected by *Haenke.*

From British Columbia to central California.

Specimens examined:

BRITISH COLUMBIA: Near Victoria, Vancouver Island, *Macoun* 306, July 21, 1893.

WASHINGTON: Grays Harbor, Chehalis County, *Wilkes Exped.;* Cascades, *Kellogg & Harford* 314, in 1868–69; upper valley of the Nesqually, *Allen* 35, August–October, 1893; near Montesano, Chehalis County, *A. A. & E. Gertrude Heller* 3985, June 29, 1898.

OREGON: Near Portland, *Kellogg & Harford* 313, in 1868–69; western Oregon, *Howell,* August, 1880.

CALIFORNIA: Mendocino County, *G. R. Vasey,* in 1875; Plumas County, *Lemmon,* in 1889; Amador County, *Hansen* 323, May 27, 1893; near Mendocino, *Brown* 831, June, 1898.

Oenanthe sarmentosa californica (Watson) C. & R. Rev. N. Am. Umbell. 92. 1888.

Oenanthe californica Watson, Proc. Am. Acad. **11**: 139. 1876.

A more southern form, with usually more approximate and acute or acutish leaflets.

Type locality, "marshes at Point Lobos," California; collected by *Kellogg;* type in Herb. Gray.

From the Bay Region, California, to San Diego County.

Specimens examined:

CALIFORNIA: Near San Diego, *Palmer,* in 1875; near Santa Barbara, *Rothrock,* July, 1875; near Los Angeles, *Hasse,* June 5, 1888, and July, 1891; near Berkeley, *Greene,* April, 1889.

After an examination of the material cited above we can find no reason for changing the conclusion reached in our Revision. The intergrades are too numerous and the characters too slight to recognize in *californica* anything more than a southern form.

In addition to the specimens cited above, which are fairly recognizable as typical *sarmentosa* and *californica*, we have two others which are not easily disposed of, and may indicate the need of further segregation. They are as follows:

A form collected by *G. R. Vasey* (303, in 1889) in Washington has the open foliage of *sarmentosa* and the leaflets of *californica* in outline, but very thin in texture. It seems impossible to associate it with *sarmentosa*, it is entirely apart from the range of *californica*, and its leaf texture suggests neither.

A form collected by *Jepson* at Jarvis Landing, Alameda County, Cal., June 19, 1897, is still more puzzling. It has the compact foliage and leaflet outline of *californica*, but the leaflets are smaller, thicker, and strongly reticulate, and the involucels are of very conspicuous bractlets exceeding the flowers and fruit.

For introduced species see page 254.

38. **LILAEOPSIS** Greene, Pittonia 2: 192. 1891. [Sept.]

Crantzia Nutt. Gen. 1: 177. 1818, not of Scopoli (1777).
Hallomuellera Kuntze, Rev. Gen. Pl. 1: 267. 1891. [Nov.]

Calyx teeth small. Fruit globose, slightly flattened laterally, glabrous. Carpel with filiform dorsal and intermediate ribs; laterals very thick and corky next the commissure; each with a small group of strengthening cells. Stylopodium depressed. Oil tubes solitary in the intervals, 2 on the commissural side. Seed terete.

Small glabrous perennials, creeping and rooting in the mud, with leaves reduced to hollow cylindrical or awl-shaped petioles (jointed by transverse partitions), minute involucral bracts, and simple few-flowered umbels of white flowers.

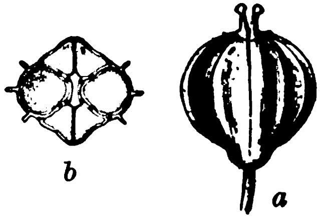


FIG. 36.—Lilaeopsis lineata.

Type species, *Hydrocotyle lineata* Michx. Fl. Bor. Am. 1: 162. 1803.

A genus of world-wide distribution, generally treated as monotypic, but we recognize the 4 following North American species:

Fruit with lateral ribs prominently corky thickened, much more conspicuous than the dorsal ones, which are not at all corky.
  Peduncles longer than the leaves .... 1. *L. lineata.*
  Peduncles much shorter than the leaves .... 2. *L. occidentalis.*
Fruit with all the ribs corky thickened, the laterals more prominent; peduncles much shorter than the leaves.
  Leaves broadening above into a spatulate or oblong blade; dorsal ribs sharply acute .... 3. *L. carolinensis.*
  Leaves filiform or linear; dorsal ribs obtuse .... 4. *L. schaffneriana.*

1. Lilaeopsis lineata (Michx.) Greene, Pittonia 2: 192. 1891. FIG. 36.

Hydrocotyle lineata Michx. Fl. Bor. Am. 1: 162. 1803.
Crantzia lineata Nutt. Gen. 1: 178. 1818.
Hallomuellera lineata Kuntze, Rev. Gen. Pl. 1: 267. 1891.

Leaves short, 2 to 5 cm. long, linear-spatulate; peduncles longer than the leaves, 3 to 7 cm. long.

Type locality, "in inundatis Carolinae inferioris."

Along the Atlantic and Gulf coasts from Massachusetts to Mississippi.

Specimens examined:

Massachusetts: Wareham, *Kennedy*, July 8, 1890.

Connecticut: New Haven, *Dana;* same station, *Wright*, in 1884; Milford, *Eames*, June–August, 1895.

Rhode Island: Providence, *Olney*, July 22, 1845; same station, *N. L. Britton*, August 10, 1878.

New Jersey: *Nuttall* (with no station given).

Virginia: Colonial Beach, *Coville*, July 6, 1890.

Florida: *Chapman* (no station given); near Jacksonville, *Torrey;* Tampa, *Garber*, May, 1876; near Jacksonville, *Curtiss* 993, also 4341, May 9, 1893, and 4915, June 19, 1894.

2. **Lilaeopsis occidentalis** C. & R. Bot. Gaz. **24**: 48. fig. 2. 1897.
Fig. 37.

Leaves elongated linear, narrowing above, 3 to 18 cm. long; peduncles much shorter than the leaves, 2 to 4 cm. long.

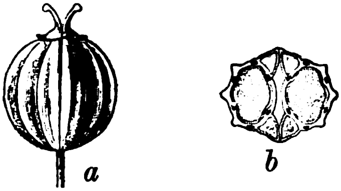


Fig. 37.—Lilaeopsis occidentalis.

Type locality, "wet places on coast of Yakima Bay, Oregon;" collected by *Hall*, no. 205, in 1871; type in U. S. Nat. Herb.

Coast region from Oregon to British Columbia and southern Alaska.

Specimens examined:

Oregon: Type specimens as cited under type locality; salt marshes of Tilamook Bay, *Howell*, July 11, 1882; same station, *Henderson* 403, July 14, 1882; near Astoria, *Meehan*, August, 1883.

Washington: Puget Sound, *Wilkes Exped.;* Seattle, *Piper* 642, June 20, 1889; Lake Washington, King County, *Suksdorf* 972, August 4, 1890.

British Columbia: Chase River, Vancouver Island, *Macoun*, June 3, 1887; near Como, Vancouver Island, *Macoun*, July 1, 1893.

Alaska: *Meehan*, July, 1883.

3. **Lilaeopsis carolinensis** C. & R. Bot. Gaz. **24**: 48. fig. 4. 1897.
Fig. 38.

Leaves very narrow and elongated below, broadening above into a spatulate or oblong blade, 5 to 25 cm. long, 4 to 15 mm. broad; peduncles very short, 1 to 1.5 cm. long; dorsal ribs sharply acute.

Type locality, "eastern North Carolina;" collected by *McCarthy*, in 1884; type in U. S. Nat. Herb.

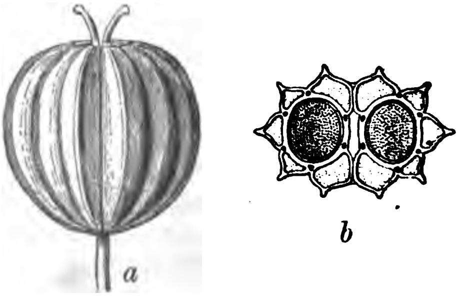


Fig. 38.—Lilaeopsis carolinensis.

North Carolina and Louisiana; will doubtless be found in the intervening region.

Specimens examined:

North Carolina: Type specimens as cited under type locality.
Louisiana: New Orleans, *Joor.*

4. **Lilaeopsis schaffneriana** (Schlecht.) C. & R. Bot. Gaz. **24**: 48. fig. 3. 1897. Fig. 39.

Crantzia schaffneriana Schlecht. Linnæa **26**: 370. 1853.

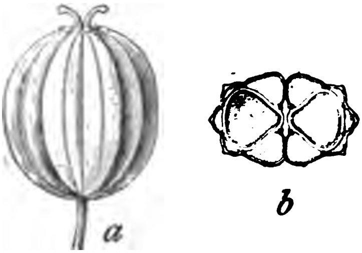


Fig. 39.—Lilaeopsis schaffneriana.

Leaves when growing in drier places almost filiform and short, 6 mm. long; when growing in water elongated linear, 20 to 30 cm. long; peduncles very short; fruit oblong, the dorsal ribs obtuse.

Type locality, "in lacu [laguna] ad urbem Mexico," near Chapultepec, Mexico; collected by *Schaffner*.

Southern Arizona, and southward through Mexico to Chile.

Specimens examined:

Arizona: Santa Cruz Valley near Tucson, *Pringle*, May 19, 1881; springs in Huachuca Mountains, *Lemmon*, August, 1882.

39. PODISTERA Watson, Proc. Am. Acad. 22: 475. 1887.

Calyx teeth prominent. Fruit flattened laterally, elliptic-ovate, glabrous. Carpel oblong-pentagonal in cross section, the ribs slender and distinct. Stylopodium depressed; styles long and ribbon-like. Oil tubes 2 or 3 in the intervals, 6 on the commissural side.

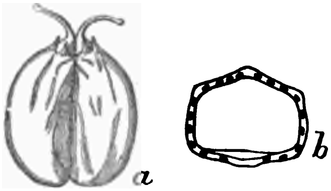


Fig. 40.—Podistera nevadensis: *a*, × 6; *b*, × 12.

A dwarf cespitose acaulescent perennial, with pinnately parted leaves, no involucre, involucels of foliaceous 3 to 5-cleft bractlets (by the reduction of the rays often forming a false involucre), and white or pinkish flowers.

A monotypic genus (based on *Cymopterus nevadensis* Gray) found as yet only near the top of Mount Dana, California.

1. **Podistera nevadensis** (Gray) Watson, Proc. Am. Acad. **22**: 475. 1887. Fig. 40.

Cymopterus nevadensis Gray, Proc. Am. Acad. **6**: 536. 1865.

Puberulent; caudex with numerous very short crowded branches bearing tufts of leaves; leaves small, 6 to 8 mm. long, rather thick, the 3 to 7 lanceolate segments acute and entire; peduncles short, but exceeding the tufts of leaves; umbels of 3 to 5 umbellets which are either sessile or with very short rays; involucels as long as umbellets; fruit little more than 2 mm. long, nearly sessile.

Type locality, "at and near the top of Mount Dana," California, at 3,900 meters altitude, forming large dense convex mats among the rocks; collected by *Brewer*, nos. 1739, 2717, June, 1863, in flower; type in Herb. Gray. Associated in the original description with the type specimens is *Lemmon* 1424, August, 1878, in fruit.

Specimens examined:

CALIFORNIA: Type locality, *Lemmon*, September, 1877, and in 1898.

40. **EURYTAENIA** Torr. & Gray, Fl. 1: 633. 1840.

Calyx teeth prominent. Fruit strongly flattened dorsally, ovate, minutely scabrous. Carpel with dorsal and intermediate ribs approximate and filiform (rarely slightly winged); laterals very prominent, thick-winged (prominently nerved on the commissural side), but with thin margins contiguous with those of the other carpel; all (especially the laterals) with prominent groups of strengthening cells. Stylopodium depressed. Oil tubes very broad, filling the intervals, 2 remarkably broad ones on the commissural side. Seed face plane.

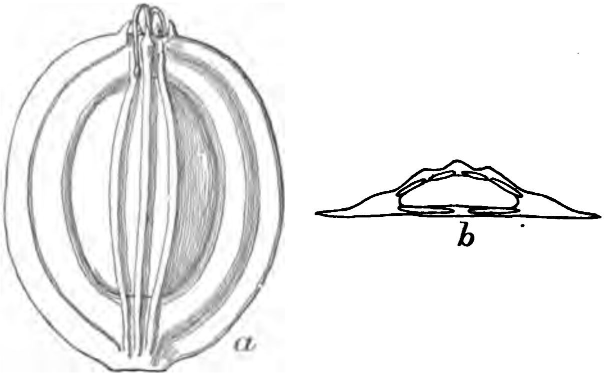


FIG. 41.—Eurytaenia texana: *a*, *b*, × 8.

Glabrous (or somewhat scabrous especially on the rays) branching herbs, with pinnately dissected leaves, involucre and involucels of usually 3-cleft bracts, and white flowers.

A monotypic genus belonging to the sandy soils of eastern Texas and adjacent Indian Territory and Oklahoma.

1. **Eurytaenia texana** Torr. & Gray, Fl. 1: 633. 1840. FIG. 41.

From 3 to 8 dm. high; leaflets long, narrowly linear to oblong, entire, serrate, toothed, or even incised; umbels 8 to many-rayed; rays 2.5 to 6 cm. long; pedicels very short; fruit 4 mm. long.

Type locality, Austin, "Texas;" collected by *Drummond;* type in Herb. Gray.

Specimens examined:

TEXAS: Hempstead, *Hall* 256, June 10, 1872; near Fort Worth, *Reverchon*, June, 1879; Hood County, *Reverchon*, June, 1882; *Nealley*, in 1888 and 1889.

OKLAHOMA: Huntsville, Kingfisher County, *Laura Blankinship*, June 5, 1896; Anadarko, *Sheldon* 167, July 17, 1891.

41. **SPHENOSCIADIUM** Gray, Proc. Am. Acad. 6: 536. 1865.

Calyx teeth obsolete. Fruit flattened dorsally, cuneate-obovate, hirsute. Carpel strongly flattened dorsally, strongly ribbed at base, winged above; dorsal and intermediate wings narrow, lateral broader. Stylopodium small and conical (or flat in flower). Oil tubes solitary in the intervals, 2 on the commissural side. Seed face plane.

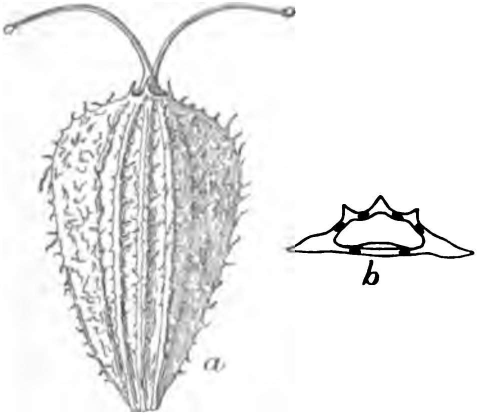


FIG. 42.—Sphenosciadium capitellatum: *a, b*, × 6.

Nearly simple thick-rooted perennials, with stout stems glabrous up to the tomentose umbel, once or twice pinnate leaves with bladdery dilated petioles, no involucre, involucels of numerous linear-setaceous bractlets, and scarious white or sometimes purplish flowers sessile on an enlarged receptacle and forming a compact head.

Type species, *Sphenosciadium capitellatum* Gray.

A genus of at least 2 species, belonging to the Sierra Nevada of California and adjacent Nevada, northward to eastern Oregon and Idaho.

This species was merged under *Selinum* by Bentham & Hooker, but it seems to us entirely worthy of restoration. Its inflorescence is very peculiar, and the discovery of one if not more additional species confirms its generic rank.

Foliage glabrous; fruit about 5 mm. long........................ 1. *S. capitellatum.*
Foliage somewhat scabrous; fruit about 7 mm. long .... 2. *S. eryngiifolium.*

1. **Sphenosciadium capitellatum** Gray, Proc. Am. Acad. 6: 537. 1865. FIG. 42.

Selinum capitellatum Watson, Bot. King Surv. 126. 1871.

Very stout, 3 to 15 dm. high; leaves large and glabrous; the leaflets oblong to linear-lanceolate, 2.5 to 5 cm. long, with rather few laciniate teeth or lobes, more or less entire below; umbel equally 4 to 15-rayed, with globose umbellets of sessile pubescent flowers having involucels of a few deciduous bractlets; rays 2.5 to 5 cm. long; fruit cuneate-obovate, about 5 mm. long.

Type locality, "in the Sierra Nevada, near Ebbett's Pass [Alpine County, Cal.], by a stream, in flower;" collected by *Brewer;* type in Herb. Gray. Associated with the type in the original description is *Anderson*, from near Carson City, Nev., in fruit.

Along streams, from the mountains of northeastern California and adjacent Nevada to eastern Oregon and Idaho.

Specimens examined:

CALIFORNIA: Plumas County, *Mrs. R. M. Austin;* Sierra County, *Lemmon*, June, 1889; Hermit Valley, Alpine County, altitude 2,700 meters, *Hansen* 324, August 23, 1893; Colby, Butte County, *Mrs. C. C. Bruce*, July, 1896; near Lassen Buttes, Plumas County, *Brown* 608, August 1-15, 1897.

OREGON: Subalpine bogs and wet meadows, *Cusick* 1392, September, 1886; Crook County, altitude 1,270 meters, *Leiberg* 464, July 18, 1894; near Shirk, Harney County, altitude 1,500 meters, *Leiberg* 2605, July 19, 1896; Alvord Valley, base of Steins Mountains, *Cusick* 2034*a*, July 15, 1898.

IDAHO: Near Ketchum, *Henderson* 3405, July 23, 1895.

The Oregon and Idaho specimens are of the narrower-leaved type; and *Leiberg* 2605 has foliage slightly roughened.

2. **Sphenosciadium eryngiifolium** (Greene) C. & R.

Selinum eryngiifolium Greene, Pittonia **2**: 102. 1890.

Resembling *S. capitellatum*, but smaller; leaves paler and somewhat scabrous, bipinnate or the primary divisions appearing ternate, more dissected; segments narrower and more confluent, fewer toothed or lobed and with pungent tips, and more elongated cuneate base; fruit about 7 mm. long, with more prominent wings.

Type locality, "near the Yosemite Valley, California;" collected by *Elmer Drew*, June, 1889.

Dry soil, mountains of southern California.

Specimens examined:

CALIFORNIA: San Jacinto Mountains, *Parish* 986, August, 1881; headwaters of Keweah River, Tulare County, altitude 2,750 meters, *Coville & Funston* 1475, August 4, 1891; Yosemite Valley, *Canby*, August 15, 1895; San Jacinto Mountains, altitude 2,700 meters, *H. M. Hall* 720, July 22, 1897.

Two additional forms can not be referred to either of the above species, but our material is too meager to justify definite characterization. They are as follows:

A form from the southern Sierras of California, collected by *Rothrock* (no. 386), September, 1875, at an altitude of 2,940 meters, has the general characters of *S. eryngiifolium*, but the leaflets are elongated linear and mostly entire.

A form from Fresno County, Cal., collected by *Mrs. Rawson Peckinpah*, October, 1890, has large leaves, with large and crowded lanceolate to ovate, irregularly serrate or toothed, more or less confluent segments; rays more slender and elongated, bearing smaller heads. The plant has the pallid look and somewhat scabrous foliage of *S. eryngiifolium*, but otherwise seems quite distinct. Our specimen is in young flowering condition.

The following species, recently described as *Selinum validum* by Mr. J. W. Congdon, in Erythea 7:185. 1900, certainly belongs in the genus *Sphenosciadium*, but whether it is specifically distinct or not we are not prepared to state. Mr. Congdon promised us material, but was not able to furnish it in time for this paper. His description is here published in full. We suspect that the plant is only an altitudinal variation.

"Plant stout, tall, unusually strong pubescent in all its parts. Stems 3 to 6 feet high, leafy. Leaves biternately or bipinnately divided, usually broadly ovate in outline, sometimes nearly a foot in diameter; the ultimate leaflets usually ovate, serrate, usually acuminate, 1 to 2 feet long. Fruit and inflorescence about the same as in *S. capitellatum* Benth. & Hook.

"The present species, *S. capitellatum*, and *S. eryngiifolium* Greene, are three closely allied and perhaps confluent forms. Their inflorescence and fruit are almost identical, but they differ greatly in foliage and in general appearance. *S. capitellatum* is often nearly or quite glabrous, with rather slender few-leaved stems and long peduncled umbels; the leaves long-petioled, pinnately or bipinnately divided; the ultimate leaflets narrowly oblong to lanceolate. It is in our region mostly confined to the east side of the main Sierra. *S. eryngiifolium* has a more condensed growth, with leafy stems and shorter peduncled heads; the leaves bipinnately dissected into oblong or lanceolate very acute or mucronate ultimate segments only one-fourth to one-half inch long. It grows for the most part in the high mountains at 8,000 to 11,000 feet. *S. validum* differs in the particulars named above, and belongs to the western slope of the mountains, descending with the streams to the foothills. It is particularly abundant near Wawona."

42. **LIGUSTICUM** L. Sp. Pl. 1: 250. 1753.

Calyx teeth small or obsolete. Fruit oblong or ovate, flattened laterally if at all, glabrous. Carpel with all the ribs prominent and equal (intervals broad), acute or sometimes slightly winged, a group of strengthening cells beneath each rib. Stylopodium conical. Oil tubes 2 to 6 (mostly 3 to 5) in the intervals, 6 to 10 on the commissural side. Seed with round or angled back; face from plane to deeply concave, with or without a central longitudinal ridge.

Smooth perennials from large aromatic roots, with usually large ternately or ternate-pinnately compound leaves (simply pinnate in two species), mostly no involucre, usually involucels of narrow bractlets, and white or pinkish flowers in large many-rayed umbels.

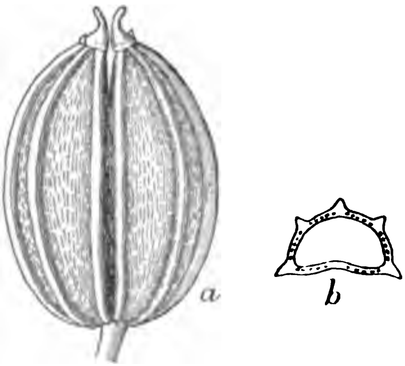


Fig. 43.—Ligusticum canadense: a, b, × 8.

First species cited is *Ligusticum levisticum* L., which is the type of the genus *Levisticum*. The second species cited is *Ligusticum scothicum*, the only Linnæan species remaining in the genus.

A genus of about 50 species, widely distributed throughout the Northern Hemisphere, but also in Chile and New Zealand; 21 species are described as belonging to the United States and Canada, but this number will probably be increased.

Leaves with at least the primary divisions ternate.
  Leaves ternately decompound, with broad leaflets simply toothed or serrate; eastern species (or high northern).
    Stem branched above; leaves large, 3 to 4-ternate............. 1. *L. canadense.*
    Stem simple; leaves biternate .... 2. *L. scothicum.*
  Leaves ternate-pinnately compound; western species.
    Leaflets large and broad, serrate or toothed.......................... 3. *L. verticillatum.*

Leaflets small, laciniately toothed or pinnatifid.
Stems more or less leafy.
Fruit merely ribbed, not at all winged.
Glabrous throughout; fruit narrowly oblong .... 4. *L. californicum.*
Inflorescence puberulent; fruit broadly oblong.
Leaflets coarsely toothed or lobed .... 5. *L. apiodorum.*
Leaflets deeply cleft into linear lobes.................. 6. *L. apiifolium.*
Fruit more or less winged.
Leaflets more or less confluent.............................. 7. *L. canbyi.*
Leaflets more or less distinct.
Fruit 4 to 5 mm. long.
Involucels none.. 8. *L. leibergi.*
Involucels present... 9. *L. simulans.*
Fruit 6 to 7 mm. long.
Ultimate leaf divisions narrowly linear.............. 10. *L. filicinum.*
Ultimate leaf divisions not narrowly linear.
Pedicels 6 to 8 mm. long; inflorescence puberulent or glabrous .... 11. *L. porteri.*
Pedicels slender, 8 to 15 mm. long; glabrous throughout.. 12. *L. goldmani.*
Stems naked or nearly so, giving an acaulescent appearance.
Leaves with ultimate divisions narrowly linear to filiform. 13. *L. tenuifolium.*
Leaves with ultimate divisions broader.
Flowers purple or purplish.............................. 14. *L. purpureum.*
Flowers white.
Leaflets small and crowded.
Rays 1 to 2 cm. long.. 15. *L. grayi.*
Rays 2.5 to 5 cm. long .... 16. *L. oreganum.*
Leaflets larger and distant.
Rays 5 cm. long or more .... 17. *L. cusickii.*
Rays 2.6 to 3.5 cm. long .... 18. *L. pringlei.*
Low acaulescent plants with simply pinnate leaves.
Involucre conspicuous; Alaskan................................. 19. *L. macounii.*
Involucre wanting or of 1 or 2 bracts; mountains of southwest Colorado.................................... 20. *L. eastwoodae.*

1. **Ligusticum canadense** (L.) Britton, Mem. Torr. Club **5**: 240. 1894. FIG. 43.

Ferula canadensis L. Sp. Pl. **1**: 247. 1753.
Ligusticum actaeifolium of authors, not of Michx.

Stem stout, branched above, 6 to 18 dm. high, leafy, with somewhat puberulent inflorescence; leaves large, 3 to 4-ternate; leaflets 5 to 13 cm. long, variable in size and toothing, usually large and ovate or oblong (often broadly so), and coarsely serrate, sometimes small and lanceolate and sparsely toothed or even entire; umbel 10 to 20-rayed, with involucels of few short bractlets; rays (fruiting) 2.5 to 5 cm. long; pedicels 2 to 4 mm. long; fruit ovate, 4 to 6 mm. long, with prominent somewhat winged ribs; oil tubes 3 or 4 in the intervals, 6 on the commissural side.

Type locality, "Virginia;" collected by *Clayton.*

From southern Pennsylvania to Georgia, and west to Missouri.

Specimens examined:

VIRGINIA: Peaks of Otter, Bedford County, altitude 1,050 meters, *Curtiss*, July 26, 1871; Peak Mountain, Pulaski County, altitude 660 meters, *Small*, July 16, 1892.

NORTH CAROLINA: Statesville, *Hyams*, August, 1877; mountains, *G. R. Vasey*, in 1878; Roan Mountain, altitude 1,200 meters, *Chickering*, July 1, 1880; Linville, *Kelsey*, September, 1890; summit of Table Rock Mountain, Burke County, *Small & Heller* 66, July 2, 1891; Swain County, altitude 540 meters, *Beardslee*, August 5, 1891; near Columbus, Polk County, *Townsend*, July 2, 1897; Biltmore and Highlands, Macon County, *Bilt. Herb.* 5549, August-September, 1897.

GEORGIA: Yellow River, Gwinnett County, altitude 225 meters, *Small*, July 11, 1893; Lookout Mountain, *Ruth* 425, July, 1898.

ALABAMA: Gadsden, Etowah County, *Pollard & Maxon*, July 29, 1900.

TENNESSEE: Cocke County, *Kearney* 702, August 25, 1897.

MISSOURI: Shannon County, *Bush*, June 1, 1890.

The type locality of *Ligusticum actaeifolium* Michx. Fl. 1: 166. 1803, a species persistently associated with the above, is "on the banks of the St. Lawrence, near Tadousac," which is in the Province of Quebec at the mouth of the Saguenay. Both the description and the type locality forbid association with a species not reported north of southern Pennsylvania, and chiefly developed still farther south. What *L. actaeifolium* represents is not clear, but it is probably the *Coelopleurum* of the North Atlantic region, which is common on the lower St. Lawrence, and was found by Pringle in Temiscouata, just across the St. Lawrence from Tadousac.

2. **Ligusticum scothicum** L. Sp. Pl. 1: 250. 1753.

Stem simple, 3 to 6 dm. high, somewhat leafy, with glabrous inflorescence; leaves biternate; leaflets ovate to obovate or nearly rotund, 2.5 to 5 cm. long, coarsely toothed; umbel 8 to 15-rayed, with involucre of 1 to 8 linear bracts, and involucels of several linear bractlets; rays (fruiting) 2.5 to 7.5 cm. long; flowers often pinkish; calyx teeth small, persistent; fruit narrowly oblong, 4 to 6 mm. long, with prominent somewhat winged ribs; oil tubes small, 2 or 3 in the intervals, 6 on the commissural side.

Type locality, "ad litora Maris in Anglia, Suecia."

Salt marshes along the east coast from Labrador (and up the St. Lawrence) to Connecticut; along the entire Alaskan coast; also coasts of northern Asia and Europe.

Specimens examined:

LABRADOR: *Kenaston*, in 1891; Capisan Island, *Waghorne*, August 14, 1894.

NEWFOUNDLAND: Crevices of cliffs, Placentia, *Robinson & Schrenk*, August 24, 1894.

NEW BRUNSWICK: Charlo, Restigouche, *Fowler*, July 30, 1874.

QUEBEC: Rocky shores of the St. Lawrence, Province of Temiscouata, *Pringle*, in 1879.

MAINE: Shore of Bakers Island, *Redfield*, July 23, 1890.

MASSACHUSETTS: Marthas Vineyard, *Burgess*, August, 1889; on Buzzards Bay near Juissett, in herb. *Walter Deane.*

ALASKA: Fort St. Michael, Norton Sound, *Bannister*, in 1865–66; Sitka, *Kellogg* 181, in 1867; Shumagin Island, *Harrington*, in 1871–72; Unalaska, the *Albatross*, July, 1888; Port Chester, *Fassett*, July, 1890; Unalaska, *James Macoun*, July 25, 1891; shore of Gastineaux Channel, *Grace E. Cooley*, July 31, 1891, St. Paul and Unalaska Islands, *Merriam*, July 26–August 12, 1891; Yakutat Bay, *Funston* 70, July 18, 1892; Unalaska and Amakuak Islands, *Evermann* 150, 170, August 2, 1892; Yes Bay, *Gorman* 56, June 30, 1895; same station, *Howell* 1629, August 6, 1895; Pribilof (St. Paul) and Unalaska (Dutch Harbor) islands, *True & Prentiss* 93, 134, August 18–29, 1895; Dyea, *Canby* 97, August 28, 1897; Prince William Sound (Virgin Bay), Kukak Bay, and Unalaska, *Coville & Kearney* 1214, 1674, 1760, June–July, 1899; Yakutat Bay, Prince William Island, Shumagin, Unalaska, Kadiak, *Trelease* 4531, 4532, 4533, 4534, 4538, 4542, June 22–July 19, 1899; Yakutat Bay, *Saunders* 4530, June 20, 1899; Kadiak, Sand Point, Cape Karluk, *Brewer & Coe* 228, 276, 491, July 2–19, 1899.

3. **Ligusticum verticillatum** (Geyer) C. & R. Contr. Nat. Herb. **3**: 320. pl. 12. 1895.

Thapsia verticillata Geyer, Jour. Bot. **6**: 233. 1847.
Angelica verticillata Hook. Jour. Bot. **6**: 233. 1847.

Glabrous throughout, or inflorescence somewhat rough, rather stout, 6 to 7 dm. high; leaves once or twice ternate then pinnate; leaflets large, 2.5 to 7.5 cm. long, ovate to oblong, serrate or toothed, occasionally somewhat lobed (unusually simple for a western *Ligusticum*), pale beneath; umbel unequally many-rayed, rather compact, with no involucels; fruiting rays 2.5 to 7.5 cm. long; pedicels 6 to 12 mm. long; fruit oblong, 6 mm. long, with distinctly winged ribs; stylopodium low conical.

Type locality, "shady grassy borders of pine woods, on high plains of the Nez Perces Indians;" collected by *Geyer*, no. 414, in 1841; type lost, according to Hemsley.

Idaho.

Specimens examined:

IDAHO: Near Forest, Nez Perces County, altitude 1,050 meters, *A. A. & E. Gertrude Heller*, 3453, July 21, 1896; Craig Mountains, *Henderson*, 2665, June 24, 1894.

4. **Ligusticum californicum** C. & R., sp. nov.

Resembling *L. apiodora*, but glabrous throughout; leaves not so large, once or twice ternate then pinnatifid; leaflets ovate, obtuse, usually rounded at base, incised-pinnatifid; fruit narrowly oblong, 4 mm. long, with filiform ribs; stylopodium more slender conical.

Type locality, Covelo, Mendocino County, Cal.; collected by *Chesnut*, July-August, 1897; type in U. S. Nat. Herb.

Only known from the type locality.

5. **Ligusticum apiodorum** (Gray) C. & R.

Pimpinella apiodora Gray, Proc. Am. Acad. **7**: 345. 1868.

Glabrous except the puberulent inflorescence and scabrous leaf margins; rather stout, 6 to 9 dm. high; leaves ternately decompound; leaflets more or less distinct below, confluent above, pale beneath, oblong or somewhat cuneate, incised; umbels 6 to 15-rayed, with involucels of linear or setaceous bractlets; rays 2.5 to 5 cm. long; pedicels 6 to 10 mm. long; flowers white or pinkish; fruit broadly oblong, 3 to 4 mm. long, with sharp filiform ribs; stylopodium low, broad conical; oil tubes numerous in the intervals (4 or 5 in the dorsal, 6 in the laterals), 8 or more on the commissural side.

Type locality, "rocky hills along the coast of California from Mendocino County to San Francisco," collected by *Bolander;* type in Herb. Gray.

In the coast region from San Francisco, Cal., to western Oregon.

Specimens examined:

CALIFORNIA: Sausalito, Marin County, *Kellogg & Harford* 310, in 1868–69; Mendocino County, *G. R. Vasey*, in 1875; Lagunitas, Marin County, *Alice Eastwood*, July, 1894; Sausalito, Marin County, *Alice Eastwood*, June, 1898.

OREGON: "Dry open woods, western Oregon," *Howell*, June, 1880; Portland, *Henderson*, in 1882.

Pimpinella apiodora nudicaulis Gray, Proc. Am. Acad. **8**: 385. 1872, is to be referred to *Ligusticum*, but we have not been able to refer the material definitely to any described species. The type is a small flowering specimen now in Herb. Gray, and was collected by *Hall* (no. 206) in Oregon in 1871.

6. **Ligusticum apiifolium** (Nutt.) Gray, Proc. Am. Acad. **7**: 347. 1868.

Cynapium apiifolium Nutt. in Torr. Gray Fl. **1**: 641. 1840.

Glabrous except the puberulent inflorescence and scabrous leaf margins; stems sometimes tall (9 to 12 dm.), with 1 to 3 small leaves; leaves twice or thrice ternate then pinnate; segments usually distinct, ovate, deeply cleft into linear usually entire and acute lobes scarcely paler beneath; umbel many-rayed, with involucels of linear bractlets; rays 5 to 10 cm. long; pedicels 6 to 10 mm. long; fruit broadly oblong, 4 mm. long, sharply ribbed; stylopodium low conical; oil tubes 3 to 5 in the intervals, 4 to 8 on the commissural side.

Type locality, "plains of Oregon, near the confluence of the Wahlamet;" collected by *Nuttall*, June–July; type in Herb. Philad. Acad., fragments of type in Herb. Gray.

In the lower Columbia River region of Oregon and Washington.

Specimens examined:

OREGON: Type specimens as cited under type locality; Oregon City, *Kellogg & Harford* 314, July, 1869; *Hall* 207, in 1871; Sauvies Island, Multnomah County, *Howell;* Portland, *Henderson*, in 1882.

WASHINGTON: Near Montesano, Chehalis County, *Henderson* 2578, June 25, 1892; same station, *A. A. & E. Gertrude Heller* 3973, June 28, 1898.

An examination of the type specimens, and of good material from the type locality, has enabled us to come to an understanding of this species. In the Gray Herbarium there is also a sheet of Nuttall's *Cynapium nudicaulis*, which was included in *L. apiifolium*. The specimen is only in flower, but the different foliage suggests a distinct species.

7. **Ligusticum canbyi** C. & R. Rev. N. Am. Umbell. 86. 1888.

Stem about 6 dm. high, with alternate peduncles, leafy at base, with a small cauline leaf or two, and glabrous inflorescence; leaves large, biternate; leaflets lanceolate, 7.5 to 10 cm. long, pinnately parted below, then confluent, finally toothed above, the larger segments more or less laciniately toothed (teeth and lobes not so sharp as in *L. verticillatum*); umbel of numerous rays, with involucels of elongated (1 to 2 cm.) linear bractlets; rays 5 cm. long; pedicels 10 to 12 mm. long; fruit (immature) with long slender conical stylopodium and prominent winged ribs; oil tubes 5 or 6 in the intervals, 6 to 8 on the commissural side.

Type locality, "low grounds, near head waters of Jocko River, Montana;" collected by *Canby*, no. 155, July 16, 1883; type in Herb. Canby (now in College of Pharmacy, New York City).

In the mountains of northwestern Montana, northern Idaho, northeastern Washington, and adjacent British Columbia.

Specimens examined:

MONTANA: Type specimens as cited under type locality.

IDAHO: Pend Oreille River, *Lyall*, in 1861; head of Bear Creek, Bitter Root Forest Reserve, altitude 2,000 meters, *Leiberg* 2978, September 1, 1897.

WASHINGTON: "From Fort Coville to Rocky Mountains," *Lyall*, in 1861 (this may be an Idaho station; the label also cites "Galton Mountains, altitude 5,000 feet").

BRITISH COLUMBIA: Donald, Columbia Valley, *Macoun*, July 13, 1885.

8. **Ligusticum leibergi** C. & R., sp. nov. PLATE IV.

Glabrous, except the slightly roughish inflorescence; stem tall, somewhat leafy, usually with verticil of 3 to 7 peduncles surrounding the stouter and larger central one; leaves large, twice ternate, then pinnate; segments lanceolate, acuminate, laciniately cleft into narrow sharp-pointed and sometimes toothed lobes; lateral peduncles 1 to 3 dm. long (the umbels often sterile), the central one 2 to 4 dm. long; umbel equally many-rayed, with no involucels (rarely a bractlet or two); rays 2.5 to 5 cm. long; pedicels 8 to 12 mm. long; fruit oblong, 4 to 5 mm. long, with thin narrow wings; stylopodium conical.

Type locality, Traille River Basin, Kootenai County, Idaho; collected by *Leiberg*, no. 614, June–August, 1891; type in U. S. Nat. Herb.

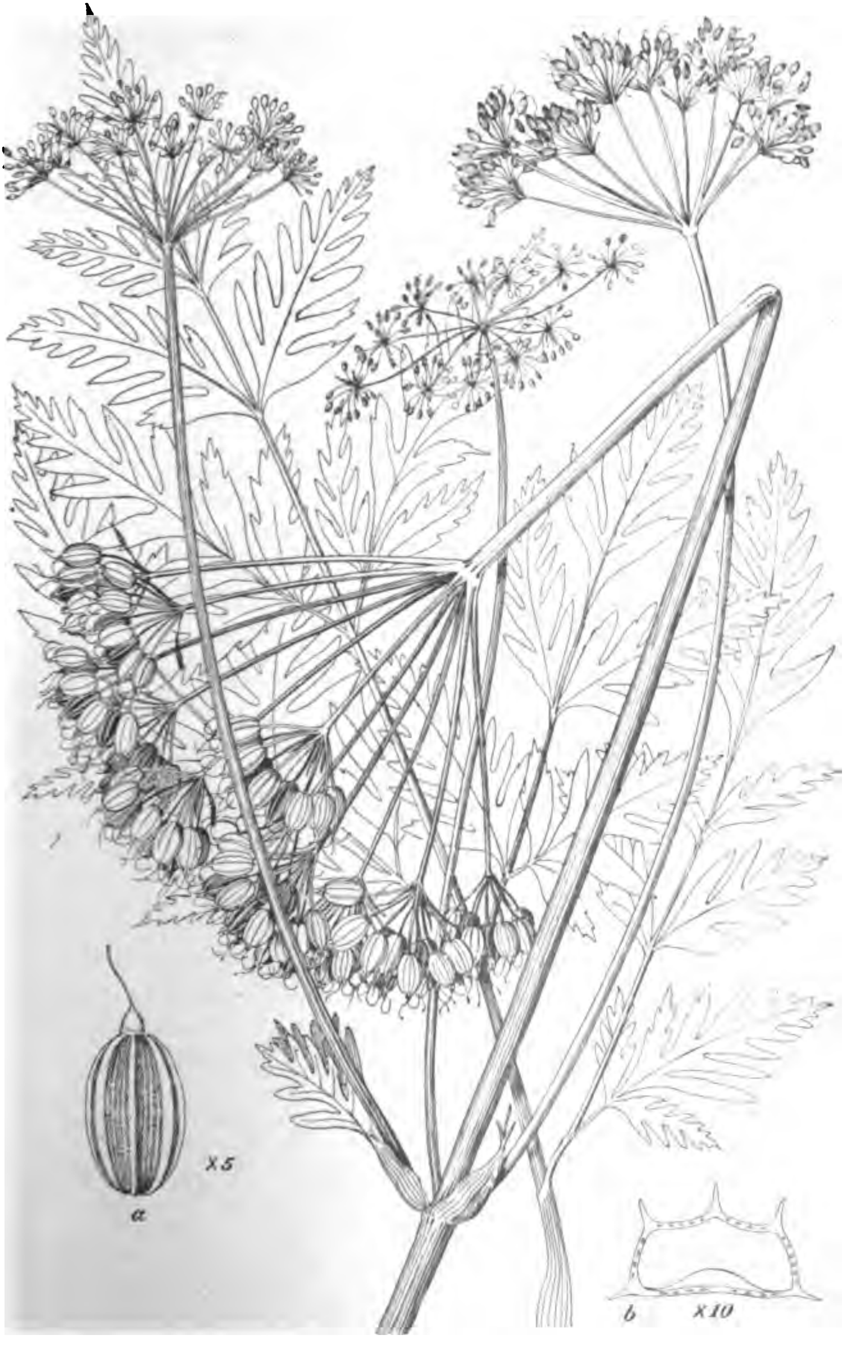
Idaho and eastern Washington.

Specimens examined:

IDAHO: Traille River Basin, Kootenai County, *Leiberg* 614, June–August, 1891; Lake Cœur d'Alene, Kootenai County, *Sandberg* 535, July 2, 1892; St. Maries, Kootenai County, *Henderson* 2663, 2664, August 3, 1894; Desmet, Kootenai County, altitude 850 meters, and Sohans Pass, altitude 1,650 meters, *Leiberg* 9, 429, June–August, 1895; Priest River Range, altitude 1,500 meters, *Leiberg* 2727, July 17, 1897; Lake Cœur d'Alene, *Henderson* 4607, August 8, 1898; Payette Lake, *Jones*, July 26, 1899.

WASHINGTON: *G. R. Vasey*, August, 1889; Rock Creek (near Mica Peak), Spokane County, *Suksdorf* 1199, June–July, 1889; high ridges of the Blue Mountains, Wallawalla County, *Piper* 2342, July 15, 1896.

EXPLANATION OF PLATE IV.—Fig. *a*, dorsal view of carpel; *b*, cross section of carpel.



LIGUSTICUM LEIBERGI C. & R., sp. nov.

This species was taken by us for *Angelica verticillata* Hooker and was so figured in the Contributions U. S. National Herbarium, Vol. III, pl. 12. Prof. L. F. Henderson, who has collected extensively in the region from which the type specimens came, insists that material which he has collected is certainly typical. We have therefore somewhat reluctantly yielded to his claims.

9. **Ligusticum simulans** C. & R., sp. nov.

Glabrous except some slight roughness in the inflorescence; rather stout, 6 to 9 dm. high; leaves nearly all basal, varying greatly in size, ternate, then once or twice pinnate; segments narrowly oblong to ovate, variously toothed or lobed; umbel many-rayed, with involucels of linear bractlets; rays (fruiting) 2.5 to 7.5 cm. long; pedicels 6 to 10 mm. long; flowers white; fruit oblong, 4 to 5 mm. long, the ribs with narrow and very thin wings; stylopodium low conical.

Type locality, Lincoln Gulch, Wyoming; collected by *Aven Nelson*, no. 2626, August 13, 1896; type in U. S. Nat. Herb.

Mountains of Wyoming.

Specimens examined:

WYOMING: Laramie Peak, *Nelson* 1601, August 7, 1894; same station, Centennial Valley and Laplata Mines, *Nelson* 1665, 1677, 1784, August, 1895; Woods Creek and Lincoln Gulch (type specimens), *Nelson* 2086, 2626, August, 1896; Carbon County (Beaver Dam, Sierra Madre, and Battle Lake), *Nelson* 3389, 3402, 3410, 4175, August, 1897.

Easily confused with *Conioselinum scopulorum.*

10. **Ligusticum filicinum** Watson, Proc. Am. Acad. **11**:140. 1876.

Stem 4 to 9 dm. high, more or less leafy, with glabrous inflorescence; lower leaves often very large, once or twice ternate, then bipinnate; the segments or their pinnatifid divisions narrowly linear; umbel of numerous rays, with involucels of one or few small linear bractlets; rays (fruiting) 2.5 to 5 cm. long; pedicels 6 to 10 mm. long; fruit narrowly oblong, 6 to 7 mm. long, with somewhat prominent conical stylopodia, and prominent somewhat winged ribs; oil tubes 3 to 5 in the intervals, 6 to 8 on the commissural side.

Type locality, "Uinta Mountains," northern Utah, altitude 2,400 meters; collected by *Watson*, no. 454, August, 1869; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Mountains of Utah, northwestern Wyoming, and western Montana.

Specimens examined:

UTAH: Type specimens as cited under type locality; Alta, Wasatch Mountains, altitude 2,700 meters, *Jones* 1170, August 4, 1879.

WYOMING: Wind River Mountains, *Forwood*, July 25, 1881; northwestern Wyoming, *Rose* 189, in 1893; Lewis River, Yellowstone Park, *A. & E. Nelson* 6591, August 21, 1899.

MONTANA: Lost Horse Pass, Bitter Root Forest Reserve, altitude 2,000 meters, *Leiberg* 2991, September 10, 1897.

11. **Ligustic[illegible]ri** C. & R. Rev. N. Am. Umbell. 86. 1888.

Rather [illegible] to 9 dm. high, leafy, with glabrous or puberulent infloresce[illegible]ge, biternate then bipinnate; the numerous rather crowded segments lanceolate to lanceolate-ovate, laciniately pinnatifid, toothed to entire, varying greatly in the degree and character of cutting, the lobes ranging from very narrow and sharp to broad and obtuse; umbel of numerous rays, mostly with neither involucre nor involucels; rays (fruiting) 2.5 to 5 cm. long; pedicels 6 to 8 mm. long; flowers white or pinkish; fruit oblong-ovate, 6 to 7 mm. long, with rather prominent winged ribs; stylopodium broad and low; oil tubes 4 to 6 in the intervals, 8 to 10 on the commissural side.

Type locality, "head waters of the Platte," near Denver, Colo.; collected by *J. M. Coulter*, June 25, 1873; type in Herb. Coulter.

In the Rocky Mountain region, from New Mexico and Arizona to Wyoming.

Specimens examined:

NEW MEXICO: *Rothrock*, in 1874; near Las Vegas, *G. R. Vasey*, in 1881; *Walcott*, July 2, 1883; White Mountains, Lincoln County, altitude 2,700 meters, *Wooton* 549, August 16, 1897.

ARIZONA: Bill Williams Mountain, *Rusby* 630, June, 1883; Bill Williams Mountain, altitude 2,100 meters, *MacDougal* 324, July 22, 1898.

UTAH: Canyon above Kings Meadows, altitude 1,950 meters, *Ward* 222, June 16, 1875; southern Utah, *Palmer* 176, in 1877; Mount Ellen (Henry Mountains), altitude 3,000 meters, *Jones* 5680, July 25, 1894; Bromide Pass, altitude 3,000 meters, *Jones* 5695, August 27, 1894.

COLORADO: Type specimens as cited under type locality; Boulder, *Letterman*, July 20, 1885; mountains near Denver, *Hocham*, July, 1889; La Plata Mountains, *Alice Eastwood*, July 23, 1890; Delta County, altitude 2,100 meters, *Cowen* 24, July 10, 1892; Red Cliff, altitude 2,400 meters, *Bethel*, July 2, 1894; Steamboat Springs, altitude 2,700 meters, *Crandall*, July 14, 1894; Telluride, altitude 3,240 to 3,300 meters, *Tweedy* 202, 203, August 25, 1894; Gore Mountains, altitude 2,850 meters, *Bethel*, August, 1895; Elk Canyon, altitude 2,250 meters, *Crandall*, August 8, 1897; La Plata Canyon, *Baker, Earle & Tracy* 546, July 12, 1898; Grand Mesa, *Bethel*, August, 1898; mountains near Pagosa Peak, altitude 2,700 to 3,600 meters, *Baker*, August 18, 1899.

WYOMING: Northwestern Wyoming, *Rose* 207, August 15, 1893; Moose Falls, Yellowstone Park, *A. & E. Nelson* 6580, August 21, 1899.

The variability of the foliage suggests a possible plexus, but our material does not permit segregation without field study.

12. **Ligusticum goldmani** C. & R. Proc. Wash. Acad. 1: 146. 1900.

Stems 5 to 8 dm. high, glabrous throughout, somewhat branching above; leaves *Conium*-like, thrice ternate then once to twice pinnate; ultimate segments ovate, small, entire or toothed, acute; peduncles more or less verticillate, 1 to 3 dm. long; rays very numerous, 3 to 8 cm. long; pedicels slender, 8 to 15 mm. long; involucre none; involucel none or of one or two bractlets; flowers white; fruit oblong, 7 to 8 mm. long; ribs with sharp thin wings; stylopodium as broad as high.

Type locality, "Chihuahua [Mexico]; Sierra Madre, 65 miles east of Batopilas;" collected by *E. A. Goldman*, no. 209, in 1898; type in U. S. Nat. Herb.

Mountains of Chihuahua, Mexico, and southern Arizona.

Specimens examined:

ARIZONA: Huahuaca Mountains, *C. G. Pringle*, July 8, 1884 (distributed as *L. filicinum* and afterwards referred to *L. porteri*).

13. **Ligusticum tenuifolium** Watson, Proc. Am. Acad. **14**: 293. 1879.

Stem slender, 3 to 6 dm. high, naked above the base or with a single leaf, bearing 1 to 3 glabrous umbels; leaves small, ternate, then pinnately decompound, finely dissected with laciniately divided leaflets, the ultimate segments narrowly linear to filiform; umbel few-rayed (6 to 12), with involucels of 1 or 2 narrowly linear bractlets; rays about 2.5 cm. long; pedicels 4 to 6 mm. long; fruit oblong, 3 to 4 mm. long, with narrow ribs; oil tubes 3 to 5 in the intervals, 6 to 8 on the commissural side.

Type locality, "mountains of Colorado;" collected by *Hall & Harbour*, no. 216 (in part); type in Herb. Gray. Associated with the type in the original description is "*Wolf & Rothrock* 721."

From the mountains of central Colorado to central Idaho and eastern Oregon.

Specimens examined:

COLORADO: Middle Park, *Parry*, in 1864; South Park, altitude 3,150 meters, *Wolf* 721, August, 1873.

IDAHO: Near Pettit Lake, Salmon River Valley, *Henderson* 3613, July 30, 1895; same station, altitude 2,145 meters, *Evermann* 388, August 16, 1895.

OREGON: Eagle Creek Mountains, altitude 1,500 to 2,100 meters, *Cusick* 1057, August, 1883; Union, Union County, altitude 1,500 to 2,400 meters, *Cusick* 1818, August, 1897.

14. **Ligusticum purpureum** C. & R., sp. nov.

Glabrous, except the puberulence at base of umbels and on rays; stems slender, 5 to 6 dm. high; leaves nearly all basal, once or twice ternate then pinnate; leaflets more or less distinct, ovate, and obtuse, 1 to 2.5 cm. long, serrate above and becoming more or less lobed below; umbel few-rayed, with involucels of few linear-lanceolate bractlets; rays 2 to 3 cm. long; pedicels 4 to 6 mm. long; flowers purple or purplish-tinged; fruit oblong, 4 mm. long, with ribs narrow but winglike; stylopodium low conical.

Type locality, Goat Mountains (Cascades), Washington, altitude 1,350 meters; collected by *Allen*, no. 259, September 25, 1896; type in U. S. Nat. Herb.

Cascade Mountains of Washington.

Specimens examined:

WASHINGTON: *Sandberg & Leiberg* 731*a*, in 1893; Mount Rainier, altitude 1,950 meters, *Piper* 2009, August, 1895; type specimens as cited under type locality.

15. **Ligusticum grayi** C. & R. Rev. N. Am. Umbell. 88. 1888.

Ligusticum apiifolium minus Gray, Bot. Calif. 1: 264. 1876.

Stems 2 to 4 dm. high, with leaves small and all nearly basal, and glabrous inflorescence; leaves ternate then pinnate; the segments ovate, laciniately toothed; umbel of numerous rays, with involucels of several narrowly linear elongated bractlets; rays 1 to 2 cm. long; pedicels 4 to 6 mm. long; fruit narrowly oblong, 3 to 5 mm. long, with short conical stylopodium, and narrow prominent almost winged ribs; oil tubes 3 to 5 in the intervals, 8 on the commissural side.

Type locality, "Ostrander's Meadows," Yosemite Valley, California; collected by *Bolander*, no. 6341, in 1866, altitude 2,400 meters; type in Herb. Gray, duplicate in U. S. Nat. Herb. Associated with the type in the original description is *Brewer* from Ebbetts Pass, Alpine County.

In the Sierra Nevada of California, from the Yosemite region to Siskiyou County.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; Ebbetts Pass, Alpine County, altitude 2,550 meters, *Brewer* 2082, in 1863; Mount Stanford and Mount Shasta, *Hooker & Gray*, in 1877; Soda Springs, Nevada County, altitude 2,100 meters, *Jones* 2937, July 20, 1881.

16. **Ligusticum oreganum** C. & R., sp. nov.

Resembling *L. grayi*, but taller (reaching 6 dm.), and with larger leaves; leaf segments with sharper lobes; rays 2.5 to 5 cm. long; pedicels 4 to 8 mm. long; fruit with narrow wings and low thick stylopodium.

Type locality, Eagle Creek Mountains, Union County, Oreg.; collected by *Cusick*, no. 1058, August–September, 1884; type in U. S. Nat. Herb.

Only known from type locality.

17. **Ligusticum cusickii** C. & R., sp. nov.

Glabrous throughout; stems slender, 5 to 6 dm. high; leaves nearly all basal, once or twice ternate then pinnate; leaflets rather distant, ovate, obtuse, 1 to 2.5 cm. long, lacerate into linear or narrow divisions; umbel few-rayed, with involucels of a few linear-setaceous bractlets; rays about equal, 5 cm. long or more; pedicels 6 to 8 mm. long; fruit oblong, 4 mm. long, with narrow but wing-like ribs; stylopodium slender conical.

Type locality, higher mountains of eastern Oregon, altitude 1,800 to 2,400 meters; collected by *Cusick*, no. 1799, in 1897, and said to be very abundant; type in U. S. Nat. Herb.

From the mountains of northeastern California to those of eastern Oregon.

Specimens examined:

OREGON: Type specimens as cited under type locality; Warner Range, Lake County, altitude 1,800 meters, *Coville & Leiberg* 24, July 25, 1896.

CALIFORNIA: Sierra Valley, *Lemmon*, June, 1889.

18. **Ligusticum pringlei** C. & R., sp. nov.

Resembling *L. cusickii*, but stouter, somewhat taller and more branching, and with larger leaves; leaflets less distant, acute or obtuse,

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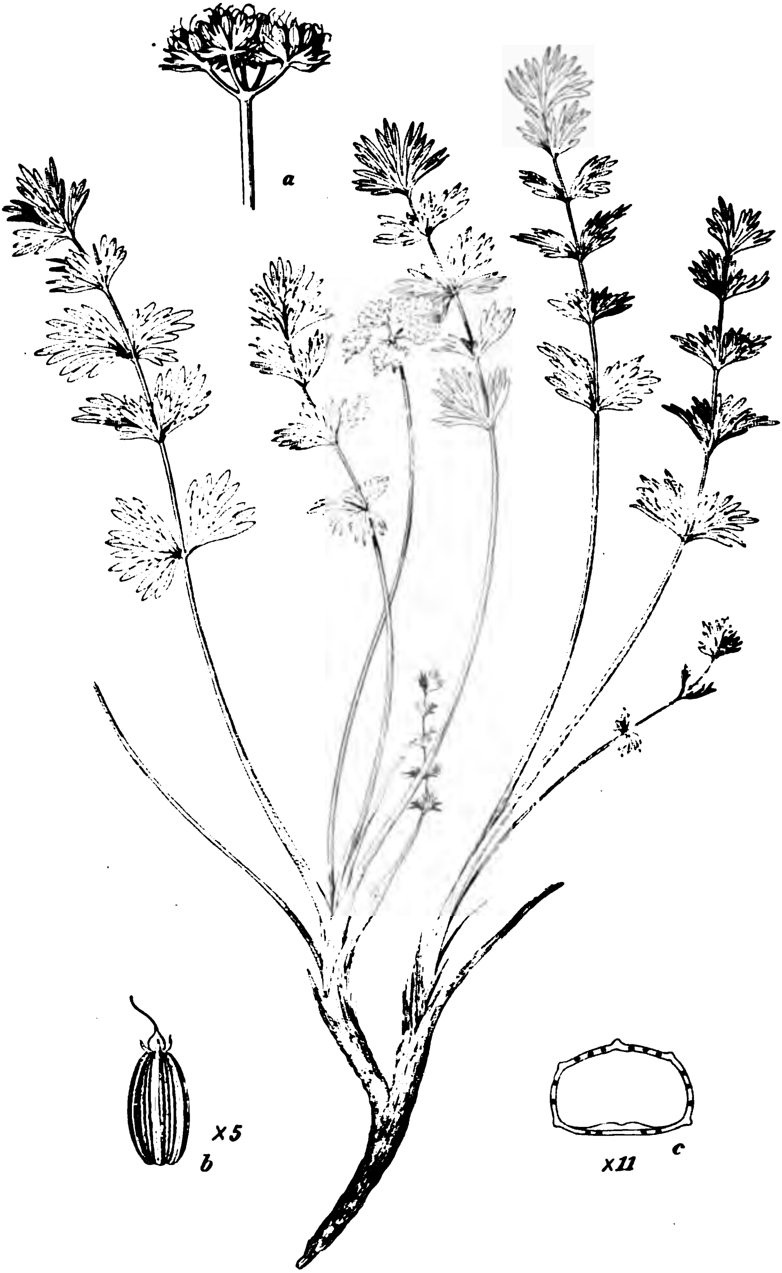


LIGUSTICUM EASTWOODEA C. & R.

irregularly toothed and lobed; rays 2.5 to 3.5 cm. long; fruit 4 to 5 mm. long, with conical stylopodium.

Type locality, along streams, Siskiyou County, Cal.; collected by *Pringle*, no. 19, August 28, 1882; type in Herb. Gray.

In the Sierra Nevada of eastern California, from the Yosemite to Siskiyou County.

Specimens examined:

CALIFORNIA: In addition to the type, the following specimens seem referable here: Near Donner Lake, *Torrey* 179, in 1865; Yosemite Valley, *Bolander* 4951, in 1866; Sierra County, *Lemmon*, June, 1883; Mariposa County, *Congdon*, August 13,1895.

The above specimens from the Californian Sierras have been heretofore referred to *L. apiifolium*.

19. **Ligusticum macounii** C. & R. Contr. Nat. Herb. **1**: 289. pl. 23. 1893.

Low, acaulescent, 10 to 12.5 cm. high, glabrous; leaves pinnate, small, 12 to 20 mm. long, on petioles 12 to 30 mm. long; leaflets 5, oblong or oval, 3 to 5-lobed or cleft; umbel compact, with about 4 nearly equal rays, and conspicuous involucre and involucels of narrow bracts; flowers purple; rays 6 to 18 mm. long; pedicels about 2 mm. long; fruit broadly ovate, dark purple, 4 mm. long, with prominent ribs; oil tubes 2 or 3 in the intervals, 2 to 4 on the commissural side.

Type locality, "Cape Vancouver, Alaska;" collected by *J. M. Macoun*, August 9, 1891; type in U. S. Nat. Herb.

Alaska.

Specimens examined:

ALASKA: Type specimens as cited under type locality; Port Clarence and St. Matthew Island, *Coville & Kearney* 1938, 2136, July 12–15, 1899; Port Clarence and St. Matthews, *Trelease* 4540, 4541, 4542, July 12–15, 1899.

20. **Ligusticum eastwoodae** C. & R. Contr. Nat. Herb. **3**: 320. pl. 13. 1895. PLATE V.

Low, acaulescent, 10 to 30 cm. high, glabrous; leaves pinnate, 10 to 15 cm. long; leaflets 7 to 13, opposite, oval, 2 to 3-lobed, and lobes 2 to 3-cleft into linear acute segments; umbel few-rayed, compact, with involucre of 1 or 2 bracts or none, and conspicuous involucels of bractlets longer than the fruit; rays 4 to 6 mm. long; pedicels about 2 mm. long; fruit ovate, glabrous, 3 mm. long, with small ribs; stylopodium conical; oil tubes 2 or 3 in the intervals.

Type locality, "Cumberland Basin, La Plata Mountains, Colorado;" collected by *Alice Eastwood*, July–August, 1892; type in U. S. Nat. Herb.

An alpine species in the high mountains of southwestern Colorado.

Specimens examined:

COLORADO: Type specimens as cited under type locality; near Leadville, altitude 3,300 meters, *Bethel*, July 1, 1894; Telluride, altitude 3,900 meters, *Tweedy* 200, August 18, 1894; Bear Creek Divide, La Plata Mountains, altitude 3,300 meters, *Baker, Earle & Tracy* 215, June 29, 1898; mountains near Pagosa Peak, altitude 3,300 meters, *Baker*, August 28, 1899.

EXPLANATION OF PLATE V.—Fig. *a*, umbel; *b*, dorsal view of carpel; *c*, cross section of carpel.

The low acaulescent habit, simply pinnate leaves, and other characters of *L. eastwoodae* and *L. macounii*, so unlike our other species of *Ligusticum*, has suggested segregation as a genus. Species of similar habit, however, such as *L. aromaticum* Banks & Soland, and *L. enysii* Kirk, occur in New Zealand, and such segregation would demand an extended study of the whole genus.

In addition to the species described above, numerous specimens of *Ligusticum* have been collected which do not seem to belong to them, but the material is either too scanty or too incomplete for satisfactory determination. We cite some of this material in the hope that collectors may be able to supplement much of it.

A plant of the mountains of southeastern California, collected by *Purpus* (no. 5661) at "Farewell Gap," altitude 1,090 meters, in 1897, is not associated geographically with any known *Ligusticum*. It suggests *L. porteri* somewhat, which grows in northern Arizona, but it is acaulescent, with small fruit (4 to 5 mm.) and prominent conical stylopodium.

We can not determine *Kellogg & Harford* 304 and 309, June 24, 1868, from Oakland Hills, California. The plants are apparently different from either *L. apiodorum* or *L. californicum* of the same region.

Undetermined forms from the upper Rogue River region of southwestern Oregon are *Applegate* 2638 (Jackson County), July, 1898; and *Coville & Applegate* 1184 (Jefferson Mountain), August, 1898.

A form collected in flower near Montesano, Chehalis County, Wash., by *A. A. & E. Gertrude Heller* (no. 3973), June 28, 1898, has foliage quite different from any of the known species of *Ligusticum*.

In the Cascade Mountains of Washington, and especially in the region of Mount Rainier, there is a group of forms which have been confused with *L. apiifolium*, and which possibly represent several species. Some of them are as follows: *Suksdorf* 58 (Mount Adams), September, 1882; *Tweedy* 288, in 1882; Piper 629 (Mount Rainier), August, 1889; *Smith* 1050 (Mount Rainier), August, 1890; *Henderson* 378 (Mount Adams), August–October, 1892; *Gorman* 669 (head of Poison Creek), September, 1897; *Gorman* 816 (Horseshoe Basin), October, 1897; *Horner* 216, July 17, 1897; *Elmer* 1222 (Mount Stuart, Kittitas County), August, 1898.

Undetermined forms from northeastern Washington are the *Wilkes Exped.* plant from Fort Colville and Spokane River, and *Sandberg & Leiberg* 731, in 1893.

In Canby's Alaskan journey of 1897, plants were collected in the Selkirk Mountains at Glacier, Canada (no. 96), and in southern Alaska, which seem quite distinct from any known species of *Ligusticum*.

A *Ligusticum* from the Coast Mountains near Waldo, Oreg., collected by *Howell* (no. 121), June 13, 1884, seems to differ from any known species. It may possibly represent *Cynapium nudicaulis* Nutt. in Torr. & Gray Fl. 1: 641. 1840, the description of which it seems to answer, but it is somewhat out of its range. The specimen has no basal leaves, so that no complete characterization is possible.

43. COELOPLEURUM Ledeb. Fl. Ross. 2: 361. 1844.

Calyx teeth obsolete. Fruit oblong, slightly flattened laterally if at all, glabrous. Carpel with very thick and prominent corky ribs, becoming hollow, the laterals broadest or all equal, each with a large group of strengthening cells. Oil tubes small, 2 to 4 on the commissural side and 1 or 2 under each rib (in addition to the one in the interval), all adhering to the seed, which is loose in the pericarp, and with plane or somewhat concave face.

Stout glabrous seacoast perennials (puberulent in the inflorescence), with 2 to 3-ternate leaves on very large inflated petioles, few-leave deciduous involucre, involucels of numerous small linear-lanceolate bractlets (sometimes conspicuous or even like the leaves), and greenish-white flowers in many-rayed umbels.

Type species, *Archangelica gmelini* DC. Prod. **4**: 170. 1830.

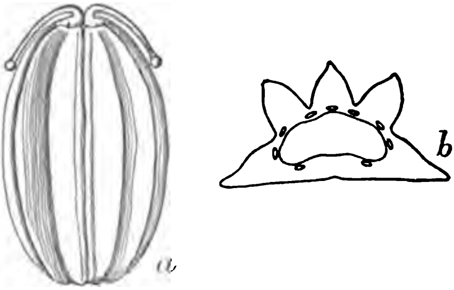


Fig. 44.—Coelopleurum longipes: *a*, × 6; *b*, × 8.

A genus of 4 or 5 species belonging to the northern coasts of North America and adjacent Asia.

Fruit with lateral ribs broader than the others; northwestern coast.
  Leaflets acute or acuminate.
    Fruit large, about 9 mm. long; Alaskan .... 1. *C. gmelini.*
    Fruit smaller, 4 to 6 mm. long; Washington and northward..... 2. *C. longipes.*
  Leaflets obtuse; Washington .... 3. *C. maritimum.*
Fruit with equal ribs; northeastern coast .... 4. *C. actaeifolium.*

1. **Coelopleurum gmelini** (DC.) Ledeb. Fl. Ross. **2**: 361. 1844.

Archangelica gmelini DC. Prodr. **4**: 170. 1830.

Densely puberulent in the inflorescence; inflated petioles very large, terminating above in two very obtuse lobes; leaflets thickish and strongly reticulate beneath, ovate (often broadly so), acute, with acute, obtuse, or cordate base, irregularly serrate or toothed, 3 to 6 cm. long, 2.5 to 5 cm. broad; rays 2.5 to 7.5 cm. long; pedicels 6 to 10 mm. long; bractlets numerous and very conspicuous, often much longer than the flowers, linear to lanceolate, and with a long acumination; fruit oblong, about 9 mm. long, the lateral ribs somewhat broader than the others (not so broad as in *C. maritimum*).

Type locality, "in Kamtschatka."

Alaska.

Specimens examined:

Alaska: Unalaska, *Harrington*, in 1871–72; Nuohagak, *McKay*, in 1881; St. Paul Island, *J. M. Macoun*, July 28, 1891; same station, *Merriam*, August 7, 1891; Khantook Island, near Yakutat Bay, *Funston* 44, June 26, 1892; Dutch Harbor, Unalaska, *True & Prentiss* 136, 138, 139, 142, August 28–29, 1895; Point Gustavus (Glacier Bay), Kukak Bay, Unalaska, St. Mathew, Kadiak, and Foggy Bay, near Cape Fox, *Coville & Kearney* 720, 1628, 1719, 2090, 2284, 2558, June 10–July 27, 1899; Popof Island, *Kincaid*, July 8–19, 1899; Yakutat Bay, Kadiak, Unalaska, *Trelease* 4529, 4536, 4539, June 22–July 8, 1899.

The mature fruit supplied by the Harrington specimens collected by Coville & Kearney has enabled us to dissociate the Alaskan *C. gmelini* from the other American forms that have heretofore been confused with it.

In our previous Revision (p. 90) two doubtful plants were mentioned under this species, viz: *Oakes* from "alpine region of the White Mountains," and *Watson* 459 from the Uinta Mountains. The former, referred at first to *Archangelica peregrina* and later to *A. gmelini*, proves to be *Angelica atropurpurea* L., while Watson's Uinta plant (distributed as *Archangelica gmelini*) is *Angelica roseana* Henderson.

2. **Coelopleurum longipes** C. & R., sp. nov. FIG. 44.

Leaflets ovate, acute to acuminate, usually narrowed and often cuneate at base, strongly veiny, sharply serrate or toothed, smaller than in *C. gmelini;* pedicels 12 to 16 mm. long; fruit oblong, 4 to 6 mm. long and 3 mm. broad, the lateral ribs slightly broader than the others.

Type locality, tide marshes near Astoria, Oregon; collected by *Joseph Howell*, no. 735, July 28, 1891; type in U. S. Nat. Herb.

Seacoast swamps, from the Columbia River to southern Alaska.

Specimens examined:

OREGON: Type specimens as cited under type locality.

WASHINGTON: Seattle, *Piper* 567, July 23, 1889; near Fairhaven, Whatcom County, *Suksdorf* 1200, July 13, 1890; along canal, near Hoodsport, Mason County, *Henderson*, August 15, 1890; seashore, Seattle, *Piper*, July, 1892; moist shores of Puget Sound, King County, *Henderson*, September, 1892.

BRITISH COLUMBIA: Drew Harbor, *Dawson*, July 1, 1888.

ALASKA: Shores of Short Bay, *Thos. Howell* 1628, July 14, 1895.

3. **Coelopleurum maritimum** C. & R. Bot. Gaz. **13**: 145. 1888.

Stems 6 to 9 dm. high; leaflets broad, often round, usually with cordate base, very obtuse, dentate or crenate-dentate, 6 to 7.5 cm. long, 6 cm. broad; rays 5 to 7.5 cm. long; pedicels 12 to 14 mm. long; fruit broadly oblong, 6 to 7 mm. long, 5 to 6 mm. broad, with lateral ribs more than twice as broad as the others.

Type locality, "wet ocean bluffs, Long Beach, Ilwaco [Pacific County], Wash.;" collected by *Henderson*, no. 384, July 24, 1886; type in Herb. Coulter.

Ocean bluffs near the mouth of the Columbia.

Specimens examined:

WASHINGTON: Type specimens as cited under type locality; same station, *Henderson*, September 7, 1892.

OREGON: Astoria, *Cooper*.

The Cooper specimens have smaller, thicker, and much more rugose leaves than the type, but the other characters seem to be identical.

4. **Coelopleurum actaeifolium** (Michx.) C. & R.

Ligusticum actaeifolium Michx. Fl. Bor. Am. **1**: 166. 1803, not of authors generally.

Resembling *C. gmelini*, but leaflets thinner, narrowed at base, more sharply serrate and toothed; rays 2.5 to 5 cm. long; bractlets less conspicuous; fruit oblong, 4 to 6 mm. long, with nearly equal ribs.

Type locality, "ad ripas fluminis S. Laurentii, juxta Tadousack," Quebec; collected by *Michaux*.

From Massachusetts Bay to Labrador, and along the Lower St. Lawrence.

Specimens examined:

MASSACHUSETTS: On an island near Beverly, *Torrey;* Beverly Bay (no collector given), August, 1847.

MAINE: Cape Elizabeth, *Boott*, July 18, 1861; shores of Seal Harbor, Mount Desert, *Redfield*, August 1, 1890.

NEW BRUNSWICK: St. Anne, *Allen*, August 16, 1881; coast of Gaspé, *Macoun* 87, August 1, 1882.

NOVA SCOTIA: Ingonish, Cape Breton Island, *Macoun* 19120, August 3, 1898.

LABRADOR: Dumpling Harbor, *Mann*, July 17, 1864; shore of Esquimaux River, *Allen* 48, July 27, 1882.

This *Coelopleurum* is abundant in the region of the type locality of Michaux's *Ligusticum actaeifolium*, associated with *L. scothicum* L., which Michaux collected at the same station. Such a plant could hardly have escaped him, and he would naturally associate it with *L. scothicum*. Besides, it is the only plant of the region which agrees with the original description of *L. actaeifolium*. Therefore, while we have not seen the type specimen, we feel justified in identifying Michaux's plant as our *Coelopleurum* of the northeast coast, heretofore referred to the Alaskan *C. gmelini*.

A form from the "rocky shore of the St. Lawrence, Temiscouata, Canada," collected by *Pringle*, August 28, 1879, and represented only by a cluster of mature fruits, may possibly be *C. actaeifolium*, as the fruit has uniform ribs, but it is much larger, being 10 to 12 mm. long. It was mentioned in our Revision of 1888, but no new specimens have been received.

44. **OREOXIS** Raf. Ser. Bull. Bot. 217. 1830.

Calyx teeth prominent. Fruit globose, slightly flattened laterally if at all, glabrous or puberulent. Carpel with very thick and prominent equal corky ribs, each with a large group of strengthening cells. Carpophore none. Stylopodium wanting. Oil tubes 1 to 3 in the very narrow intervals, 2 on the commissural side, and a small one in each dorsal rib. Seed sulcate beneath the oil tubes, with flat or somewhat concave face.

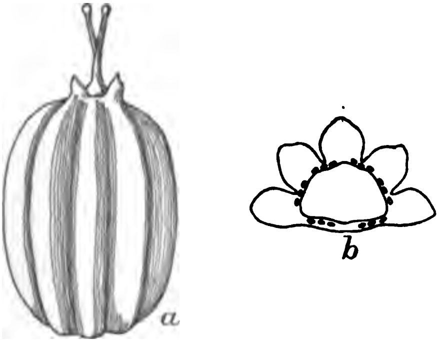


FIG. 45.—Oreoxis humilis: *a*, *b*, × 8.

Alpine cespitose perennials, with pinnate leaves usually shorter than the peduncles, no involucre, and involucels of narrow bractlets equaling the yellow flowers.

Type species, *Oreoxis humilis* Raf.

A genus of at least 2 species, belonging to the high mountains of Colorado and Utah, and probably New Mexico and Arizona.

Glabrous, except perhaps in the umbel; oil tubes more than one in the intervals.
  Involucels linear.................................... 1. *O. humilis.*
  Involucels conspicuous and toothed............................ 2. *O. bakeri.*
Puberulent; oil tubes solitary in the intervals .... 3. *O. alpina.*

1. **Oreoxis humilis** Raf. Ser. Bull. Bot. 217. 1830. FIG. 45.

Glabrous (sometimes slightly puberulent just below umbel), cespitose, from a somewhat slender elongated root; leaves pinnate, the leaflets cut into 3 to 7 linear-lanceolate segments; peduncles 2 to 7.5 cm. high; umbels few-rayed, with involucels of linear distinct bractlets; flowers bright yellow; fruit 3 to 4 mm. long; oil tubes 2 or 3 (rarely 1) in the intervals.

Type locality, "Rocky Mountains;" collected by *James*, no. 179, in 1820; type in Herb. Columbia Univ.

Summits of high mountains, Colorado, chiefly in the region of Pikes Peak.

Specimens examined:

COLORADO: Pikes Peak, altitude 3,900 meters, *Letterman* 223, August 13, 1884; same station, altitude 4,200 meters, *Sheldon* 311, August 28, 1884; same station, *Alice Eastwood*, July, 1892; same station, *Canby*, August 27, 1895; same station, altitude 3,600 to 4,200 meters, *Holzinger* 9, June 7, 1896; same station, *Knowlton* 20, June 14, 1896; Bear Creek Divide west of Mount Hesperus, altitude 3,300 meters, *Baker* 228, June 29, 1898.

2. **Oreoxis bakeri** C. & R., sp. nov. FIG. 46.

Glabrous throughout except some puberulence at the top of peduncle and on rays, cespitose, from thickish elongated roots; leaflets opposite, 3 to 5 pairs, somewhat distant, 3 to 5-cleft into linear or linear-lanceolate entire lobes; peduncles longer than the leaves, 3 to 8 cm. long, erect, or more or less inclined; flowering umbel very compact, almost head-like; fruiting rays nearly equal, 3 to 5 mm. long; pedicels 2 mm. or less long; involucel of numerous distinct obovate bractlets strongly 3-toothed at apex; fruit 3 to 4 mm. long, usually purplish; oil tubes 2 or 5 in the intervals.

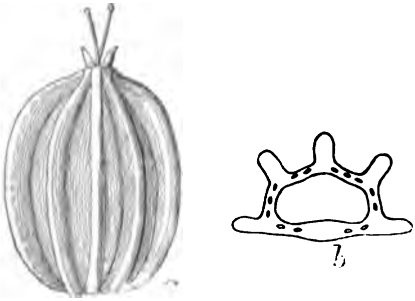


FIG. 46.—Oreoxis bakeri: *a*, *b*, × 8.

Type locality, mountains near Pagosa Peak, Colorado.

High mountains of Colorado.

Specimens examined:

COLORADO: Mount Hayden, altitude 3,900 meters, *Baker, Earle & Tracy* 577, July 14, 1898; mountains near Pagosa Peak, altitude 3,600 meters, *C. F. Baker* 12, August 23, 1899.

3. **Oreoxis alpina** (Gray) C. & R.

Cymopterus alpinus Gray, Am. Jour. Sci. II. **33**: 408. 1862.

Puberulent (rarely glabrous), with paler more dissected leaves and shorter more crowded leaflets; involucels of somewhat broader bractlets more or less united at base; flowers paler; fruit 4 to 5 mm. long, puberulent (at least when young); oil tubes solitary in the intervals.

Type locality, "on high alpine ridges," Colorado; collected by *Parry* in 1861; type in Herb. Gray.

High mountains of Colorado and extending into Utah.

Specimens examined:

COLORADO: *Wolf* 731, in 1873; type specimens as cited under type locality; Grays Peak, altitude 3,300 to 4,200 meters, *Patterson* 39 (small form), August, 1885; same station, altitude 3,990 meters, *Crandall*, July 18, 1892; Flat Top Mountains, altitude 2,700 meters, and Leadville Mountains, altitude 3,300 meters, *Bethel*, July, 1894; Cameron Pass, altitude 3,600 meters, *Crandall* 27, July 5, 1894; near Leadville, *Osterhout*, June, 1895; mountains above Boreas, altitude 3,600 meters, *Cowen* 186, August 2, 1895; near Veta Pass, *Rydberg*, June 20, 1900.

UTAH: Mount Ellen, Henry Mountains, altitude 3,300 meters, *Jones* 5669, July 25, 1894; Bromide Pass, Henry Mountains, altitude 3,000 meters, *Jones* 5695, July 27, 1894; near Fish Lake, altitude 2,700 meters, *Jones* 5826, August 11, 1894.

We have seen no specimens of this from Pikes Peak, where *O. humilis* especially abounds, but it extends over the western mountains and into Utah.

We have excluded certain larger forms, with very different foliage, which have been distributed as *O. humilis* (*Cymopterus alpinus*). In the absence of fruit their relationship can not be determined. If they belong to *Oreoxis* the genus certainly contains one or two additional species and has a more extended range. The excluded sheets are as follows: Arizona, *Palmer* 40, in 1869; Fort Wingate, N. Mex., *Marsh* 22, May 25, 1883; Grays Peak, *Patterson* 39 (large form), August, 1885.

45. **THASPIUM** Nutt. Gen. 1: 196. 1818.

Calyx teeth conspicuous. Fruit ovoid to oblong, slightly flattened dorsally if at all, mostly glabrous. Carpel with 3 or 4 or all the ribs strongly winged. Stylopodium wanting; styles long. Oil tubes solitary in the intervals, 2 on the commissural side. Seed sulcate beneath the oil tubes, almost terete or somewhat dorsally flattened, with plane face.

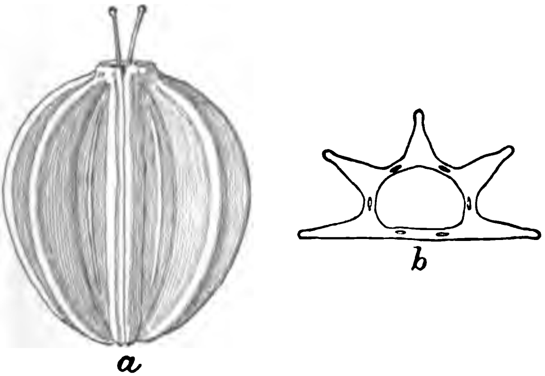


FIG. 47.—Thaspium trifoliatum: *a*, *b*, × 8.

Perennials (6 to 15 dm. high), with ternately compound leaves (divisions sometimes pinnate) and broad serrate or toothed leaflets (or lower leaves simple), mostly no involucre, involucels of small bractlets, mostly yellow flowers, and all the fruits pedicelled.

First species cited, *Thaspium aureum* Nutt.

A genus of 3 species belonging to eastern North America.

Basal leaves simple or once ternate.................................. 1. *T. trifoliatum.*
Basal leaves twice or more ternate or pinnate.
  Leaflets ovate, serrate to lanceolate.............................. 2. *T. barbinode.*
  Leaflets pinnately cut into linear or oblong lobes........... 3. *T. pinnatifidum.*

1. **Thaspium trifoliatum** (L.) Gray, Man. ed. 2. 156. 1856 (as to name). **FIG. 47.**

Thapsia trifoliata L. Sp. Pl. **1**: 262. 1753.
Smyrnium atropurpureum Desr. in Lam. Encyl. **3**: 667. 1789.
Thaspium atropurpureum Nutt. Gen. **1**: 196. 1818.
Thaspium trifoliatum atropurpureum Torr. & Gray in Gray's Man. ed. 2. 156. 1856.
Thaspium aureum atropurpureum C. & R. Bot. Gaz. **12**: 136. 1887.

Glabrous; basal leaves mostly cordate, serrate; stem leaves simply ternate (rarely biternate); leaflets ovate to lanceolate, rounded or tapering at base, serrate; umbels 8 to 12-rayed; rays 1 to 2.5 cm. long; pedicels about 2 mm. long; flowers dark purple; fruit globose-ovoid, about 4 mm. long, all the ribs equally winged.

Type locality, "Virginia."

Rhode Island to North Carolina, west to Tennessee and Illinois.

Specimens examined:

PENNSYLVANIA: Delaware County.
NORTH CAROLINA: Melrose, Polk County, *Townsend*, May 17, 1897; near Biltmore, *Bilt. Herb.* 1391*b*, May 26, 1897.
TENNESSEE: Tazewell, *Talcott*, May, 1889; Knox County, *Kearney*, May 21, 1891; Cocke County, *Kearney*, May, 1893; Post Oak Springs, Roane County, *Pollard & Maxon* 415, August 6, 1900.
KENTUCKY: Bell County, *Kearney* 510, September, 1893; Harlan County, *Kearney* 241, August, 1893.

Thaspium trifoliatum aureum (Nutt.) Britton, Mem. Torr. Club **5**: 240. 1894.

Thaspium aureum Nutt. Gen. **1**: 196. 1818.
Thaspium aureum trifoliatum C. & R. Bot. Gaz. **12**: 136. 1887.

Flowers yellow.

Type locality not given.

From New England to Georgia, and westward to Arkansas, Wyoming, and Oregon (?).

Specimens examined:

MARYLAND: High Island, in the Potomac, *Kearney*, May, 1896.
NORTH CAROLINA: Linville, *Kelsey*, September, 1890.
SOUTH CAROLINA: Aiken, *Ravenel.*
TENNESSEE: Cocke County, *Kearney* 704, September 2, 1897; near Knoxville, *Ruth* 428, June, 1898.
ALABAMA: *Winchell.*
MISSISSIPPI: Starkville, *Phares*, May, 1886.
ARKANSAS: Salado Creek, *Coville* 179, July 30, 1887.
WEST VIRGINIA: Upshur County, *Pollock*, May, 1895.
KENTUCKY: Lexington, *Garman*, May 21, 1892.
OHIO: Niles, *Ingraham*, May–July, 1891.
INDIANA: Delphi, Carroll County, *Rose*, July, 1892.
ILLINOIS: Near Chicago, *Babcock.*
MISSOURI: Wright and Shannon counties, *Bush*, June, 1884, 1888, 1890; *Tracy*, June 21, 1885; Jefferson County, *Hasse*, June, 1887; Jackson County, *Mackenzie*, June 6, 1897; Eagle Rock, *Bush* 209, June 26, 1897.
WYOMING: La Barge, *Stevenson* 23, June, 1894.

2. **Thaspium barbinode** (Michx.) Nutt. Gen. Pl. **1**: 196. 1818.

Ligusticum (?) *barbinode* Michx. Fl. Bor. Am. **1**: 167. 1803.
Smyrnium barbinode Muhl. Cat. 31. 1813.

Loosely branched, pubescent on the joints, sometimes puberulent in the umbels; leaves 1 to 3-ternate; leaflets ovate to lanceolate, acute, with cuneate base, coarsely toothed or cut serrate, often ternately cleft or parted; flowers light yellow; fruit broadly oblong, glabrous or minutely roughened, about 6 mm. long and 4 mm. broad, with mostly 7 ribs prominently winged, the other three not at all winged or but slightly so.

Type locality, "in Carolina superiore."

From New York to North Carolina and Alabama, west to Minnesota and Arkansas.

Specimens examined:

New York: Waverly, *Coville*, June 4, 1887.

Pennsylvania: Near Lancaster, *Small*, May 14, 1891.

Maryland: Near Baltimore, *Foreman*, in 1873.

District of Columbia: *Vasey*, in 1873; *Ward*, in 1878; *Sudworth*, in 1889; Zoological Park, *Pollard* 380, June 15, 1895.

Virginia: Salt Pond Mountain, *Canby*, August, 1890; Arlington, *Blanchard*, June 28, 1891; Mount Rogers, Augusta County, *A. A. & E. Gertrude Heller* 1182, August 9, 1893.

North Carolina: Mountains, *G. R. Vasey*, in 1878; Swain County, *Beardslee* 28, August 10, 1891; Roan Mountain, *Merriam*, August 8, 1892; Biltmore, *Bilt. Herb.* 1036, May–August, 1896; Polk County, *Townsend*, June 17, 1897.

Alabama: Huntsville, Madison County, *Pollard & Maxon* 365, August 1, 1900.

West Virginia: Carroll County, *Small*, June 12, 1892; Pocahontas County and Taylor County, *Pollock*, June, 1896 and 1897.

Tennessee: Knox County, *Kearney*, May 9, 1891; Cocke County, *Kearney* 703, September 8, 1897; near Knoxville, *Ruth* 427, July, 1898.

Kentucky: Elk Lick Falls and Clay's Ferry, Kentucky River, *Garman*, August, 1892.

Illinois: Southern Illinois, *French;* near Oquawka, *Patterson.*

Missouri: Wright County, *Bush*, in 1884; Stone County, *Blankinship*, in 1887; Eagle Rock, *Bush* 205, June 6, 1897.

Arkansas: Decatur, *Plank.*

The foliage is excessively variable. In the ordinary forms the leaves are strictly ternate throughout and coarsely toothed. The variations are in the direction of leaves being cut almost into a fringe of linear or oblong lobes, and their secondary divisions becoming distinctly pinnate. The following varieties are but extreme forms, connected with the specific type by numerous intergrades.

Thaspium barbinode angustifolium C. & R. Bot. Gaz. **12**: 137. 1887.

Leaflets smaller, narrower, and more sharply cut; fruit more or less puberulent.

Type locality, near Crawfordsville, Ind.; collected by *J. N. Rose*, June, 1887; type in Herb. Coulter.

Pennsylvania to Illinois.

Specimens examined:

Indiana: Type specimens as cited under type locality; same station, *Rose*, June 22, 1892.

Illinois: Homer, Champaign County, *Uline*, June, 1891.

Thaspium barbinode chapmani C. & R.

Thaspium barbinode pinnatifidum C. & R. Rev. N. Am. Umbell. 84. 1888. Not Buckl.

Divisions of the 1 to 3-ternate leaves inclined to be pinnate; leaflets small, more or less laciniate-lobed, with rather obtuse lobes; fruit puberulent.

Type locality, calcareous bluffs, Jackson County, northwest "Florida;" collected by *Curtiss*, no. 1023; type in U. S. Nat. Herb.

Northwest Florida and possibly adjacent Georgia.

Specimens examined:

FLORIDA: Type specimens as cited under type locality.

Specimens collected by *Erwin F. Smith* on dry hills, Griffin, Spalding County, Ga., July 7, 1890, may possibly be this form, but lack of foliage prevents certain determination. The plants are very much stouter, and the dorsal wings are nearly equal.

Thaspium barbinode garmani C. & R., var. nov.

Low and rather slender; stem smooth, about 5 dm. high; basal leaves several and long-petioled, 1 to 2-ternate, then pinnate; very pubescent at joints and on veins beneath; leaflets ovate, small (1 to 5 mm.), sharply and finely serrate, usually somewhat lobed.

Type locality, cliffs of Kentucky River near Lexington; collected by *Garman & Rose*, August 15, 1895; type in U. S. Nat. Herb.

Only known from the type locality.

3. **Thaspium pinnatifidum** (Buckl.) Gray, Man. ed. 2. 155. 1856.

Zizia pinnatifida Buckl. Am. Jour. Sci. **45**: 175. 1843.
Thaspium walteri Shuttlw. in Pl. Wright. **1**: 79. 1852.

Slender plant with dissected leaves, puberulent on branchlets, umbels, and fruit, and with fewer leaves; leaves 1 to 3-ternate; leaflets 1 to 2-pinnatifid, lobes linear or oblong; one or two leaves near the base often very large and long-petioled (petioles sometimes 3 dm. long); flowers light yellow; fruit oblong, 3 to 4 mm. long, 2 to 3 mm. broad; all the ribs narrowly winged.

Type locality, "banks of the French Broad River near the Warm Springs, and near Sugar Town Falls, Macon County, N. C.;" collected by *Buckley;* type in Herb. Gray.

Western North Carolina and extending into Tennessee and Kentucky.

Specimens examined:

NORTH CAROLINA: Type specimens as cited under type locality; Macon County, *Rugel*, September, 1842 (type of *T. walteri* Shuttlw.); Swain County, *Beardslee & Kofoid* 23, August 10, 1891.

TENNESSEE: Davidson County, *Gattinger*.

In our previous Revision plants collected by Short in the "barrens of Kentucky" in 1842 were referred to this species. There are on the sheet fragments of four plants, one of which is true *T. barbinode*, and the other three are different, but may or may not be the same species. None of them are *T. pinnatifidum*, and collectors should look for these forms in Short's region.

46. **CONIOSELINUM** Hoffm. Gen. Umb. xxviii and 180. 1814.

Calyx teeth obsolete. Fruit oblong, dorsally flattened, glabrous. Carpel with prominent dorsal and intermediate ribs (sometimes narrowly winged), and the laterals broadly winged and thickish. Stylopodium slightly conical. Oil tubes usually solitary in the dorsal intervals, 1 to several in the lateral, 2 to 8 on the commissural side. Seed with plane or slightly concave face.

Glabrous perennials (or inflorescence sometimes puberulent), with ternate then pinnately decompound leaves, ovate acute laciniately toothed or lobed leaflets, involucre more or less conspicuous or none, involucels of numerous more or less elongated narrow bractlets, and white flowers.

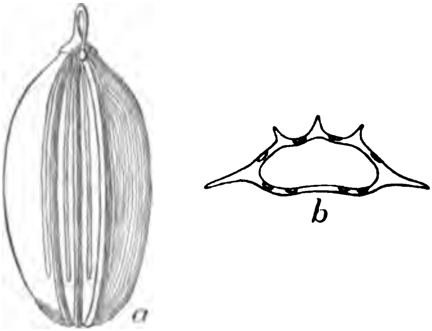


Fig. 48.—Conioselinum gmelini: *a*, × 6; b, × 8.

The genus was described in 1814 by Hoffman, but redescribed in 1816 with *Conioselinum tataricum* Hoffm. (Gen. Umb. ed. 2. 185. 1816) as the type.

A genus of 9 species, belonging to the boreal and north temperate regions of both hemispheres, 5 of which are North American.

In retaining this genus Drude recognizes 5 species (*C. canadense* Torr. & Gray, *C. kamtschaticum* Rupr., *C. latifolium* Rupr., *C. tataricum* Hoffm., and *C. univittatum* Turcz.). We add herewith 4 species, 3 of which we had heretofore referred to *Selinum* and one to *Ligusticum*. As thus organized the genus is a very natural one, of remarkably uniform habit. Its dorsally flattened fruit, with winged lateral ribs, and merely ribbed or less broadly winged dorsals and intermediates associate it in the alliance with *Angelica*, and quite apart from *Selinum* and *Ligusticum*, in which the fruit is laterally flattened and equally ribbed or winged.

We exclude *Selinum* from our flora more through inference than from any definite knowledge of that genus. The type species is *S. sylvestre* L. Sp. Pl. **1** : 244. 1753, and, aside from meager descriptions, we have seen only the plate of it published in *Flora Danica*. All the testimony we have indicates that it has a laterally flattened fruit, as Drude states, and is in the *Ligusticum* alliance.

Involucels not scarious.
  Bractlets linear and mostly entire.
    Leaflets finely dissected.
      Bractlets inconspicuous; northeastern........................ 1. *C. chinense.*
      Bractlets conspicuous; northwestern........................... 2. *C. gmelini.*
    Leaflets more coarsely lobed; Rocky Mountains............... 3. *C. scopulorum.*
  Bractlets usually spatulate-linear and more or less toothed or lobed; Californian.
    4. *C. pacificum.*
Involucels scarious.. 5. *C. dawsoni.*

1. **Conioselinum chinense** (L.) B. S. P. Prel. Cat. N. Y. 22. 1888.

Athamanta chinensis L. Sp. Pl. **1**: 245. 1753.
Selinum canadense Michx. Fl. Bor. Am. **1**: 165. 1803.
Conioselinum canadense Torr. & Gray, Fl. **1**: 619. 1840.
Conioselinum bipinnatum Britton, Bull. Torr. Bot. Club **14**: 233. 1887.

Erect, 3 to 15 dm. high; glabrous, except the somewhat puberulent inflorescence; leaves often very large; leaflets 2.5 cm. long or more, laciniately lobed; umbel 10 to 20-rayed; rays about 2.5 cm. long; pedicels 6 to 8 mm. long; fruit 4 to 5 mm. long; oil tubes 2 or 3 in the intervals (sometimes 1 in a dorsal or 4 in a lateral interval), 4 to 8 on the commissural side.

Type locality, probably Virginia; collected by *Bartram.*

From Labrador to the mountains of North Carolina, westward to central Indiana and Minnesota.

Specimens examined:

LABRADOR: Bonne Esperance, *Allen*, August 27, 1882.
NEWFOUNDLAND: Exploits River, *Robinson & Schrenk*, August 13, 1894.
NEW BRUNSWICK: St. Johns, *Boott*, August 18, 1873; Gaspé, *Macoun* 86, August 27, 1882.
QUEBEC: Mouth of the Saguenay River, *Goodale*, in 1870.
ONTARIO: Near London, *Burgess*, August 20, 1880.
MAINE: Rumford, Oxford County, *Parlin*, in 1889; Mount Desert, *Redfield*, August 6, 1890; Aroostook County, *Fernald* 49, July 25, 1893.
NEW HAMPSHIRE: Strafford County, *Boott*, September 14, 1855.
VERMONT: Fairhaven, *Eggleston*, September 12, 1897.
MASSACHUSETTS: Plymouth, *Oakes*.
NEW YORK: Oneida, *Knieskern;* Yates County, *Wright;* Ithaca, *Dudley* 60, September 13, 1875.
PENNSYLVANIA: Huntingdon County, *Porter*.
NEW JERSEY: Sussex County, *Van Sickle*, August 12, 1894.
NORTH CAROLINA: Grandfather Mountains, *Gray & Carey*, July, 1841.
INDIANA: Montgomery and Carroll counties, *Rose*, June–July, 1892.
MICHIGAN: Washtenaw County, *Boott;* Ingham County, *Wheeler*, September 15, 1891.
WISCONSIN: Near Milwaukee, *Lapham*, in 1846; Williams Bay, *Umbach*, August 20, 1897.

2. **Conioselinum gmelini** (Cham. & Schlecht.) C. & R. FIG. 48.

Ligusticum gmelini Cham. & Schlecht. Linnaea **1**: 391. 1826.
Selinum benthami Wats. Bibl. Index 432. 1878.
Selinum hookeri Watson in C. & R. Rev. N. Am. Umbell. 45. 1888.
Formerly named *C. fischeri* by American authors.

Stout, 6 to 9 dm. high, glabrous except the sometimes puberulent inflorescence; leaves large, the narrowly ovate to linear-oblong acute segments 1 to 2.5 cm. long, laciniately toothed or lobed to entire; umbel 10 to 25-rayed, with involucre of a few linear-setaceous bracts, and involucels of setaceous or linear bractlets shorter or longer than the flowers, sometimes much longer and cleft; rays about 2.5 cm. long; pedicels 4 to 6 mm. long; fruit ovate or oblong, 4 to 5 mm. long, with prominent but scarcely winged dorsal and intermediate ribs and rather broadly winged laterals.

Type locality, "Unalaska."

From Alaska and Northwest Territory southward to Washington and the Columbia River.

Specimens examined:

Alaska: Sitka, *Kellogg* 107, in 1867; Nuohagak, *McKay*, July 27, 1881; Chilcat, *Grace E. Cooley*, August 9, 1891; Otter Island, *J. M. Macoun*, August 29, 1891; Unalaska and St. George islands, *Evermann* 48, 90, July 9–31, 1892; Cape Phippe, Yakutat Bay, *Funston* 73, July 23, 1892; Adakh, St. Paul, and Akun islands, *Townsend*, July–August, 1893; St. George, St. Paul, and Unalaska islands, *True & Prentiss* 59, 77, 108, 110, 131, 135, 141, August 6–29, 1895; Yes Bay, *Howell* 1627, August 6, 1895; same station, *Gorman* 153, August 17, 1895; St. Paul Island, *J. M. Macoun*, August 5, 1896; Bering Sea, *McConn*, in 1897; Fort Wrangell, *Canby* 95, August 28, 1897; Haenke and Kadiak islands, *Coville & Kearney* 1090, 2258, 2298, June 22–July 20, 1899; Popof and Shumagin islands, *Saunders*, July 7–18, 1899; Kadiak Island, *Trelease* 4535, July 19, 1899; Juneau, *Brewer & Coe* 582, July 25, 1899.

British Columbia: Barclay Sound, Vancouver Island, *Macoun*, August 8, 1887.

Washington: Puget Sound, *Wilkes Exped.* 7; Seattle, *Piper* 631, September, 1888 and 1890; Mason County, *Piper*, July 23, 1890; near Ilwaco, Pacific County, *Henderson* 2160, September 7, 1892.

Oregon: In tide marshes near Astoria, *Howell* 736, July 28, 1891.

We find it impossible to separate the two forms heretofore known as *Selinum benthami* and *S. hookeri*.

3. **Conioselinum scopulorum** (Gray) C. & R.

Ligusticum scopulorum Gray, Proc. Am. Acad. **7**: 347. 1868.

Nearly simple, 6 to 9 dm. high, more or less leafy, with puberulent inflorescence; lower leaves often very large, twice to thrice ternate then once or twice pinnate; leaflets (sometimes small) laciniately pinnatifid; upper leaves often ternate-pinnate or simply pinnately compound; umbel of numerous rays, with involucels of several narrowly linear elongated bractlets; rays (fruiting) 5 to 7.5 cm. long; pedicels 12 mm. long; fruit about 6 mm. long; oil tubes usually 1 in the dorsal intervals and 2 in the lateral, 2 to 4 on the commissural side.

Type locality, "Santa Antonita, New Mexico;" collected by *Bigelow;* type in Herb. Gray, duplicate in U. S. Nat. Herb. Associated with the type in the original description are *Parry* 156, and *Hall & Harbour* 216 (in part), both from the mountains of Colorado. The *Suckley* Washington plant referred to is *C. gmelini*.

A species of the Rocky Mountain region, extending from Arizona and New Mexico through Colorado and Utah to eastern Oregon.

Specimens examined:

Arizona: Rucker Valley, *Lemmon* 393, in 1881; Fort Huachuca, *Wilcox* 486, September, 1894; Chirricahua Mountains, *Toumey*, in 1897.

New Mexico: Type specimen as cited under type locality; Mogollon Mountains, *Rusby* 147a, September 7, 1881; Cluska Mountains, *Walcott* 150, July 2, 1883.

COLORADO: Clear Creek, *Parry* 156, in 1861; *Hall & Harbour* 216, in 1862; *Vasey* 224, in 1868; Twin Lakes, altitude 3,300 meters, *Wolf* 714, August, 1873; *Parry*, in 1874; Pikes Peak, altitude 2,700 meters, *Letterman* 219, August 13, 1884; near Empire, *Patterson* 212, August–September, 1892; Telluride, altitude 3,150 meters, *Tweedy* 205, August 25, 1894; Stove Prairie, *Crandall*, August 20, 1895; canyon near Palmer Lake, Marshall Pass, and near Breckenridge, altitude 2,200 to 3,600 meters, *Crandall*, August 12–27, 1896; Cameron Pass, altitude 2,850 meters, *Baker*, July 29, 1896; Tennessee Pass, *Jepson*, August, 1896; Buena Vista, altitude 2,400 meters, *Crandall*, August 19, 1897.

OREGON: Streams near Snake River, *Cusick* 1391, in 1886; banks of Wallowa River, *Cusick* 2090, August 22, 1898.

4. **Conioselinum pacificum** (Watson) C. & R.

Selinum pacificum Watson, Proc. Am. Acad. **11**: 140. 1876.

Stout, 3 to 6 dm. high; leaflets 2.5 cm. long, laciniately toothed and lobed; umbel (on stout peduncle) about 15-rayed, with a conspicuous involucre of 2 or 3-lobed and toothed leaflets 2.5 cm. long and equaling the rays, and involucels of several narrowly linear or spatulate-linear bractlets, entire or 3 to 5-toothed or laciniately lobed above, equaling or exceeding the flowers; pedicels 4 to 8 mm. long; fruit oblong, 6 to 8 mm. long, 3 mm. broad, with rather narrow thin wings; oil tubes solitary in the intervals or a small additional one in a lateral interval.

Type locality, "on the Saucelito hills, near San Francisco," Cal.: collected by *Kellogg & Harford*, no. 315, in 1868–69; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

This is a very rare species and seems to be extinct at the type locality. At least, Miss Alice Eastwood has examined for several years past all the hills about Sausalito and San Francisco without finding it. A specimen of this species is in herbarium of the California Academy of Science and is said to have been collected at Long Valley, Mendocino County, by A. Kellogg. The label, however, is not an original one, and Californian collectors are urged to keep this plant in mind.

5. **Conioselinum dawsoni** C. & R.

Selinum dawsoni C. & R. Bot. Gaz. **13**: 144. 1888.

Stout, 6 to 9 dm. high, glabrous; leaflets small, 6 to 12 mm. long, laciniately toothed to entire; involucels of linear-oblong scarious bractlets longer than the pedicels and abruptly ending in a long attenuation; pedicels 2 to 4 mm. long; fruit oblong, about 4 mm. long, with prominent wings, the lateral ones but little broader; oil tubes solitary in the intervals or a small one in a lateral interval.

Type locality, "Pelly River, at Pelly Banks, Yukon, lat. 61°;" collected by *Dawson*, no. 23, August 11, 1887; type in Herb. Coulter.

Alaska, Yukon, and Mackenzie.

Specimens examined:

Alaska: Type specimens as cited under type locality; *Funston* 131, in 1893.
Yukon: Dawson City, *R. S. Williams*, August 6, 1899.
Mackenzie: Fort Good Hope, *Miss E. Taylor*, July 11, 1892.

47. ANGELICA L. Sp. Pl. 1: 250. 1753.

Archangelica Hoffm. Gen. Umb. 161. 1814.

Calyx teeth mostly obsolete. Fruit flattened dorsally, ovate or oblong, glabrous or pubescent, with prominent crenulate disk. Carpel with strong ribs, each with a group of strengthening cells; laterals usually broadly winged, distinct from those of the other carpel, forming a double-winged margin to the fruit. Stylopodium conical. Oil tubes 1 to several in the intervals or indefinite, 2 to 10 on the commissural side. Seed face plane or somewhat concave.

Stout perennials, with ternate-pinnately (rarely simply pinnate) compound leaves, scanty involucre or none, involucels of small bractlets or none, and large terminal umbels of white flowers (greenish-yellow or purplish in two or three species).

First species cited, *Angelica archangelica* L., which is *Archangelica officinalis*, the type of Hoffmann's *Archangelica*.

A genus of about 35 species, belonging to the Northern Hemisphere (North America, Europe, and western Asia) and New Zealand, 18 species occurring in the United States and Canada.

- OIL TUBES solitary in all the intervals or in pairs in some of them (except sometimes *A. californica*); western species (except *A. curtisii*).
  - Oil tubes solitary in all the intervals.
    - Leaves once or twice pinnate.
      - Involucels of conspicuous bractlets .... 1. *A. grayi.*
      - Involucels none .... 2. *A. pinnata.*
    - Leaves ternate then pinnate.
      - Stem and lower leaf surface densely tomentose .... 3. *A. hendersoni.*
      - Stem, etc., not densely tomentose.
        - Involucels of numerous bractlets .... 4. *A. genuflexa.*
        - Involucels usually wanting .... 5. *A. dawsoni.*
          - Fruit glabrous; pedicels united at base.
            - Fruit 6 to 8 mm. long, with lateral wings thick and corky. 6. *A. arguta.*
            - Fruit 4 to 6 mm. long, with lateral wings not corky thickened. 7. *A. lyallii.*
          - Fruit not glabrous; pedicels not distinctly united at base.
            - Pubescent throughout; California .... 8. *A. tomentosa.*
            - Pubescence none except in the inflorescence.
              - Fruit hispid; flowers white .... 9. *A. kingii.*
              - Fruit papillate; flowers greenish or purplish .... 10. *A. roseana.*
  - Oil tubes in pairs in some of the intervals (except sometimes in *A. californica*); involucels wanting.
    - Ovary and fruit glabrous.
      - Fruit very small (3 mm.) .... 11. *A. leporina.*
      - Fruit large (8 to 12 mm.).
        - Leaflets linear .... 12. *A. lineariloba.*

Leaflets not linear.
  Lateral wings not as broad as body; California........ 13. *A. californica.*
  Lateral wings broader than body; Eastern................ 14. *A. curtisii.*
Ovary or fruit not glabrous.
  Pedicels glabrous or nearly so; eastern Washington........... 15. *A. canbyi.*
  Pedicels hispid.
    Fruit oblong or narrowed below; leaflets acuminate; eastern California and adjacent Nevada................................ 16. *A. breweri*
    Fruit broad elliptical; leaflets acute; Utah................. 17. *A. wheeleri.*
OIL TUBES several in the intervals or continuous about the seed; Eastern species (except *A. ampla*).
  Oil tubes several in the intervals; seed adherent to pericarp....... 18. *A. villosa.*
  Oil tubes continuous about the seed, which is loose in the pericarp.
    Stout, with purple stems.
      Inflorescence glabrous; lateral wings half as broad as body; North Atlantic region .... 19. *A. atropurpurea.*
      Inflorescence puberulent; lateral wings but one-sixth as broad as body; Rocky Mountains .... 20. *A. ampla.*
    Slender; lateral wings as broad as body; Florida................ 21. *A. dentata.*

1. **Angelica grayi** C. & R.

Selinum grayi C. & R. Bot. Gaz. **13**: 144. 1888.

Usually very stout, 3 to 6 dm. high, glabrous except the more or less scabrous inflorescence, leaf margins, and veinlets (beneath); leaves once or twice pinnate, with much-dilated petioles; leaflets oblong to ovate, 2.5 cm. long, acute, toothed (sometimes laciniately toothed or lobed); umbel with involucels of conspicuous lanceolate-ovate long-acuminate bractlets; rays 2.5 to 3.5 cm. long; pedicels 2 to 4 mm. long; fruit oblong, smooth, 4 to 5 mm. long, with prominent thin wings, the laterals decidedly broadest; seed face dorsally sulcate.

Type locality, Westons Pass, "in high mountains of Colorado," altitude 3,450 meters; collected by *J. M. Coulter*, July 19, 1873; type in Herb. Coulter.

High mountains of Colorado and adjacent Wyoming.

Specimens examined:

COLORADO: Type specimens as cited under type locality; Twin Lakes, altitude 2,850 meters, *Wolf* 712, August, 1873; Pikes Peak, altitude 2,700 meters, *Letterman* 224, August 13, 1884; Graymont, *Letterman*, July 23, 1885; La Plata Mountains, *Alice Eastwood*, July 23, 1890; above Beaver Creek, altitude 3,450 meters, *Crandall* 19, August 1, 1892; Telluride, altitude 3,300 meters, *Tweedy* 207, August 25, 1894; North Park, *Osterhout*, June, 1895; mountain near Boreas, altitude 3,600 meters, *Cowen* 190, August 2, 1895; Gore Mountains, altitude 2,850 meters, *Bethel*, August, 1895; Chambers Lake, altitude 2,850 meters, *Baker*, July 13, 1897; La Plata Mountains, altitude 3,450 meters, *Baker, Earle & Tracy* 639, July 16, 1898.

WYOMING: La Plata mines, *Nelson* 1776, August 21, 1895.

2. **Angelica pinnata** Watson, Bot. King Surv. 126. 1871.

Glabrous, 6 to 9 dm. high; leaves simply pinnate, with 2 to 4 pairs of ovate to narrowly lanceolate sharply serrate to entire leaflets (lowest pair sometimes pinnate); umbels 10 to 20-rayed, with neither involucre nor involucels; rays 5 to 10 cm. long; pedicels 4 mm. long; flowers greenish-yellow or dull purple; stylopodium slightly conical; fruit oblong, glabrous (at maturity), 4 to 6 mm. long; dorsal and intermediate ribs thick and prominent; laterals with wings hardly as broad as body; oil tubes solitary in all the intervals.

Type locality, "Uinta Mountains, Utah, altitude 2,400 meters;" collected by *Watson*, no. 458, August, 1869; type in U. S. Nat. Herb.

In the mountains, from New Mexico through Colorado and Utah to Wyoming and Montana.

Specimens examined:

New Mexico: Chama, *Alice Eastwood*, August 1, 1892.

Utah: Type specimens as cited under locality; slope of Aquarius Plateau, altitude 2,550 meters, *Ward* 421, June 25, 1875; Alta, altitude 2,550 meters, *Jones*, August, 1879; Fish Lake, altitude 2,700 to 3,000 meters, *Jones* 5731, 5822, August 3–10, 1894.

Colorado: Routt County, *Alice Eastwood*, July 29, 1891; Grand River, *Beardslee* 136, August, 1892; Durango, *Alice Eastwood*, August, 1892; Gunnison County, altitude 2,700 meters, *Cowen*, August 2, 1892; near Cimarron, altitude 2,100 meters, *Crandall*, August 21, 1896.

Wyoming: Yellowstone Park, *Tweedy*, July, 1885; same station, *Letterman*, August 4, 1885; same station, *Knowlton*, August 14, 1887; same station, *Burglehaus*, August, 1893; same station, *Rose* 168, 364, August, 1893; same station, *Rydberg* 4602, 4606, 4607, 4609, August 7–10, 1897; Upper Big Wind River, *Nelson* 755, August 10, 1894; Woods Creek and Lincoln Gulch, *Nelson* 2689, August 11–20, 1896; Sylvan Geysers, Yellowstone Park, *A. & E. Nelson* 6188, July 26, 1899.

Montana: Near the Yellowstone Park, *Rose* 477, August 23, 1893.

3. **Angelica hendersoni** C. & R. Bot. Gaz. **13**: 80. 1888.

Very stout, densely tomentose throughout, especially the inflorescence and whitened lower surfaces of the leaves; leaves quinate then pinnate; leaflets thick, broadly ovate, 7.5 to 10 cm. long, 5 to 7.5 cm. broad, obtuse, broad cuneate or rounded at base, serrate; umbel equally many-rayed, with no involucre, and involucels of numerous linear-acuminate bractlets; rays 2.5 to 7.5 cm. long; pedicels 1 to 2 mm. long; ovary densely tomentose; fruit oblong, more or less pubescent, 6 to 9 mm. long; dorsal and intermediate ribs prominent; lateral wings thick and corky, as broad as body; oil tubes solitary in all the intervals.

Type locality, "bluffs moistened by sea spray, Long Beach, Ilwaco [Pacific County], Washington;" collected by *Henderson*, no. 2158, August 5, 1885; type in Herb. Coulter.

Seacoast, from southern Washington to San Francisco.

Specimens examined:

Washington: Type specimens as cited under type locality; type locality, *Henderson* 2158, September 7, 1892.

California: Berkeley, *G. R. Vasey*, in 1875; bluffs along the Golden Gate, Lands End, and Lake Merced, San Francisco, *Alice Eastwood*, October 5–6, 1895.

4. **Angelica genuflexa** Nutt. in Torr. & Gray Fl. **1**: 620. 1840.

Archangelica peregrina Nutt. in Torr. & Gray, Fl. **1**: 622. 1840.

Glabrous except the pale puberulent inflorescence, 6 to 12 dm. high; leaves once to twice ternate, the divisions often deflexed; leaflets ovate to lanceolate, more or less acuminate, irregularly and sharply serrate and sometimes lobed; umbel equally many-rayed, with no involucre, and involucels of numerous linear bractlets; rays 2.5 to 10 cm. long; fruiting pedicels 8 to 12 mm. long; fruit 3 to 4 mm. long, nearly round, emarginate at base and apex, glabrous; lateral wings broader than body; stylopodium strongly conical; oil tubes solitary in all the intervals.

Type locality, "Wappatoo Island, and near Fort Vancouver," Clark County, Wash.; collected by *Nuttall*.

From Oregon to southern Alaska.

Specimens examined:

OREGON: Near Fort Klamath, altitude, 1,470 meters, *Leiberg* 701, August 11, 1894.

WASHINGTON: Klickitat River, near Mount Adams, *Suksdorf* 762, August–September, 1895; Lake Cushman and Seattle, *Piper* 628, 907, August–September, 1890; near Olympia, *Henderson* 2524, October 2, 1892; Upper Valley of the Nesqually, *Allen* 36, August–October, 1894; near Montesano, Chehalis County, *A. A. & E. Gertrude Heller* 4035*a*, July 11, 1898.

BRITISH COLUMBIA: Craigellaichie, *Macoun*, July 18, 1889; Victoria, *J. R. Anderson*, September, 1900.

ALASKA: Sitka and Kadiak, *Kellogg* 102, 104, 181, in 1867; Popof Strait, Shumagin Islands, *Dall*, October 15, 1873; Sitka, *Evermann* 195, August 13, 1892; Yes Bay, *Howell* 1761, August 17, 1895; same station, *Gorman* 164, September 16–October 9, 1895.

5. **Angelica dawsoni** Watson Proc. Am. Acad. **20**: 369. 1885.

Thaspium aureum involucratum C. & R. Rev. N. Am. Umbell. 83. 1888.

Glabrous or nearly so, rather slender, 3 to 9 dm. high, with simple stem; basal leaves twice to thrice ternate; leaflets lanceolate, 2.5 to 5 cm. long, sharply and finely serrate, acute or acuminate, terminal one sometimes deeply 3-cleft; cauline leaves (1 or 2 or none) similar; umbel solitary, conspicuously involucrate with numerous foliaceous lacerately toothed bracts nearly equaling the rays, and involucels similar; rays about 2.5 cm. long or less; pedicels 4 to 6 mm. long; fruit glabrous, 5 mm. long.

Type locality, "Rocky Mountains near the boundary," altitude 1,950 meters; collected by *Lyall*, in 1861; type in Herb. Gray.

Rocky Mountains of northern Idaho and Montana, and northwestward.

Specimens examined:

IDAHO: Kootenai County, *Sandberg*, July, 1887; valley of Traille River, Kootenai County, *Sandberg* 889, August 10, 1892; Stevens Peak, Cœur d'Alene Mountains, altitude 1,900 meters, *Leiberg*, 455, August 4, 1895.

MONTANA: Near Columbia Falls, altitude 2,100 meters, *Williams* 1013, July 12 and August 30, 1895.

ALBERTA: Sheep Mountains, *Macoun*, in 1895.
BRITISH COLUMBIA: Type specimens as cited under type locality.

6. **Angelica arguta** Nutt. in Torr. & Gray Fl. **1**: 620. 1840.

Glabrous, except the sometimes minutely puberulent inflorescence, stout, 6 to 12 dm. high; leaves ternate then pinnate or bipinnate; leaflets mostly small, ovate to lanceolate, rather acute, serrate; umbel rather equally many-rayed, with neither involucre nor involucels; rays 2.5 to 7.5 cm. long; pedicels 6 to 10 mm. long; fruit oblong-elliptical, glabrous, 6 to 8 mm. long; dorsal and intermediate ribs thick and slightly elevated; lateral wings very corky, thick, and as broad as the much-flattened body or broader; oil tubes 2 on the commissural side, distant, or sometimes 4 in two distant pairs; seed sulcate beneath the oil tubes, with plane face.

Type locality said to be "Wappatoo Island and near Fort Vancouver," in the Lower Columbia River Basin; collected by *Nuttall;* type in Herb. Torrey.

Specimens examined:

OREGON: Type specimens as cited under type locality.

In the Revision we stated that "this plant was reported by Nuttall from 'Fort Vancouver, Oregon,' and then lost sight of, being confused with *A. genuflexa.* An examination of the type (in good fruit in the Torrey Herbarium) abundantly confirms our conclusions given in Botanical Gazette xiii, 80." Unfortunately no new material of this species has come to light during the last twelve years, which has led some of our best Western collectors to doubt our conclusions. Nuttall, who collected the type, obtained it (at least in part) from Wappatoo Island, in the Lower Columbia. At the same place he collected *Angelica genuflexa* and *Archangelica peregrina.* The inference has been that these three species are one and the same. Mr. L. F. Henderson has collected extensively in recent years on this island, and has found only one species. This has led us to reexamine the type, and our opinion is that *A. arguta* is different from *A. genuflexa.* It seems much nearer *A. lyallii,* to which we were once constrained to refer it. It grows at so much lower elevations, however, that it seems impossible to consider the two identical.

7. **Angelica lyallii** Watson, Proc. Am. Acad. **17**: 374. 1882.

Glabrous except the sometimes puberulent inflorescence, stout, 6 to 15 dm. high; leaves ternate then once or twice pinnate, the uppermost reduced to large inflated petioles; leaflets extremely variable in size, ovate to lanceolate, rather acute, serrate or dentate; umbel many-rayed, with neither involucre nor involucels; rays 2.5 to 25 cm. long; pedicels 2 to 10 mm. long, coalescent at base (giving a "web-footed" appearance); fruit oblong to obovate, glabrous, 4 to 6 mm. long; dorsal and intermediate ribs thick and slightly elevated; lateral wings as broad as the often much flattened body or broader; oil tubes solitary in all the intervals.

Type locality, "in the Galton and Cascade Mountains, near the British boundary;" collected by *Dr. Lyall.*

In the mountains, from eastern Oregon to northwestern Wyoming and northward to Alberta.

Specimens examined:

ALBERTA: Sheep Mountain, Waterton Lake, *Macoun* 10676, July, 1895.

WASHINGTON: Mount Adams, altitude 1,800 to 2,100 meters, *Suksdorf* 761, August-September, 1885; *G. R. Vasey*, in 1889; Olympic Mountains, *Piper* 1052, September 27, 1890; Yakima County, *Henderson* 2523, July 31, 1892; Blue Mountains, Columbia County, altitude 1,200 meters, *Piper* 2336, July 15, 1896.

OREGON: White Mountains, altitude 1,200 to 1,800 meters, *Cusick* 1056, in 1884; Hood River, *Howell*, July 27, 1886; *Sheldon* 8638, in 1897.

IDAHO: Nez Perces County, *Sandberg* 393, June 14, 1892; Lake Cœur d'Alene, *Sandberg* 565, July 6, 1892; Lake Pend Oreille, *Leiberg* 151, June–September, 1892; Moscow Mountains, *Henderson* 2666; Nez Perces County, altitude 1,050 meters, *Brown* 10, August, 1893; Pettit Lake, altitude 2,160 meters, *Evermann* 385, August 13, 1895; Mill Creek and near Salmon, altitude 2,250 to 2,400 meters, *Henderson* 4066, 4067, August, 1895; Cœur d'Alene Mountains, altitude 850 meters, *Leiberg* 333, July 21, 1895; near Reeder Creek, altitude 900 meters, *Leiberg* 2742, July 23, 1897; near Lake Cœur d'Alene, *Henderson* 4606, August 7, 1898; Weiser River and Payette Lake, *Jones*, June 15–26, 1899.

MONTANA: Near Red Lodge, *Rose* 31, 478, July–September, 1893; Columbia Falls, *Williams* 379, August 20, 1894; Spanish Basin, Madison Range, altitude 1,800 meters, *Flodman* 691, July 22, 1896; Indian Creek and Forks of the Madison, *Rydberg* 4603, 4604, July 21–26, 1897.

WYOMING: Yellowstone Park, *Tweedy;* same station, *Rydberg* 4608, August 7, 1898; Moose Falls, Yellowstone Park, *A. & E. Nelson* 6579, August 21, 1899.

8. **Angelica tomentosa** Watson, Proc. Am. Acad. **11**: 141, 1876.

Stout with coarse hoary pubescence; leaves ternate or quinate then once or twice pinnate; leaflets thickish, ovate, acute, oblique at base, 5 to 10 cm. long, unequally and sharply serrate or toothed; umbel somewhat equally many-rayed, with neither involucre nor involucels (rarely a bractlet or two); rays 2.5 to 10 cm. long; pedicels 8 to 12 mm. long; ovary densely pubescent; fruit oblong-elliptical, more or less pubescent, 6 to 8 mm. long, 4 to 5 mm. broad; dorsal and intermediate ribs small and acutish; lateral wings thin, about as broad as body; stylopodium low conical, with long reflexed styles; oil tubes solitary in all the intervals.

Type locality, "in the coast ranges from San Francisco to Mendocino County, Cal.;" type in Herb. Gray.

In the mountains from Mendocino County to San Diego County, Cal.

Specimens examined:

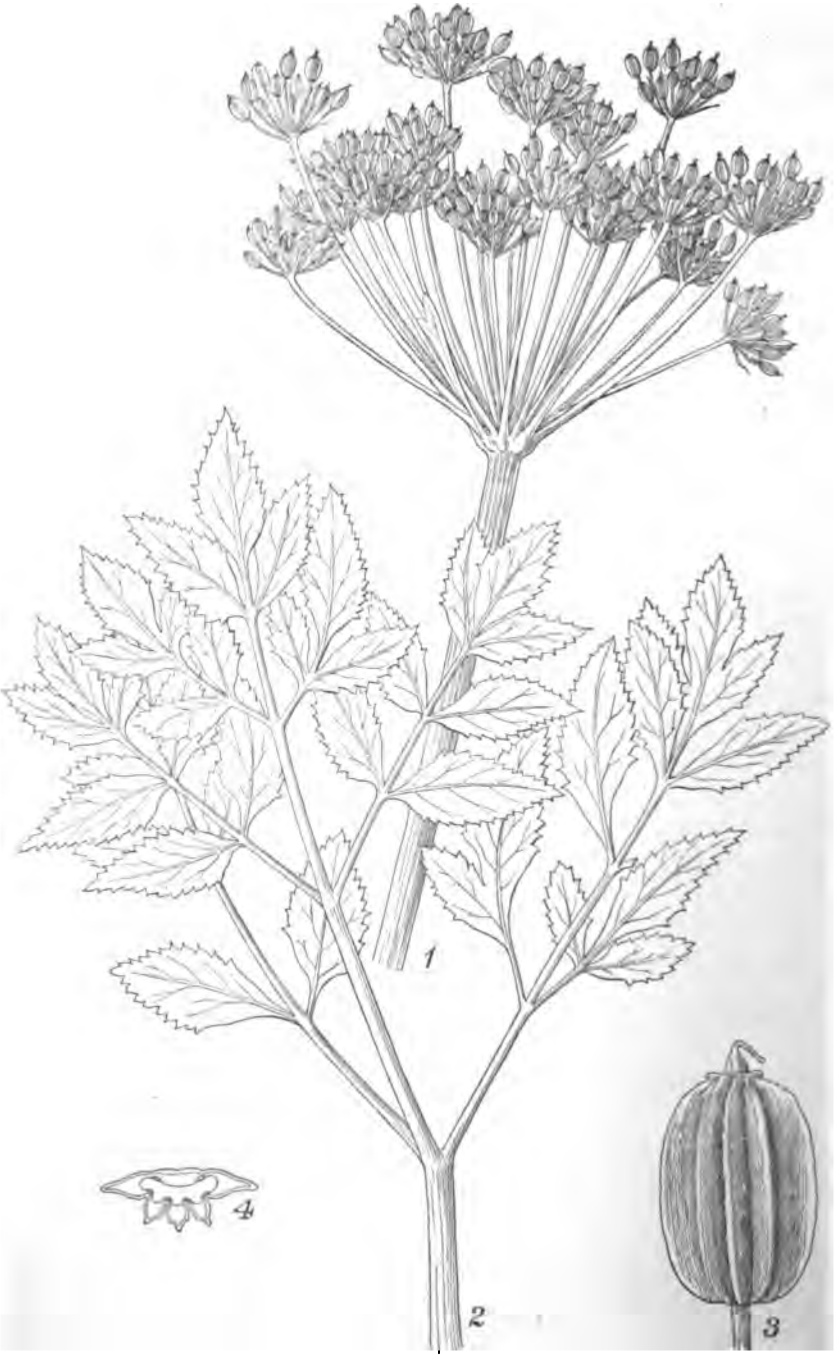
CALIFORNIA: Near San Francisco, *Wilkes Exped.* 1377; *Kellogg & Harford* 317, 1161, in 1868–69; Sausalito, Marin County, and Mendocino County, *G. R. Vasey*, in 1875; Howell Mountain, Napa River Basin, *Jepson*, February 23, 1896; San Jacinto Mountains, San Diego County, *Hall* 740, July 29, 1897.

A specimen collected by *Lemmon* in June, 1887, in the "Sierra Valley," has been referred to this species, but it is so distant from the normal range that we doubt it. The lack of foliage and good fruit prevents any more definite disposition of it.

9. **Angelica kingii** (Watson) C. & R.

Selinum kingii Watson, Bot. King Surv. 126. 1871.

Smooth (except the slightly pubescent inflorescence), 3 to 6 dm. high; lower leaves bipinnate, the upper nearly simply pinnate, with



ANGELICA ROSEANA HENDERSON.

dilated petioles; leaflets ovate or linear-lanceolate, 2.5 to 7.5 cm. long, coarsely and unevenly serrate; umbel 5 to 10-rayed, with neither involucre (rarely a bract or two) nor involucels; pedicels 4 to 6 mm. long; fruit broadly ovate, hispid, 4 to 6 mm. long; lateral wings broader than the narrow dorsal and intermediate ones; stylopodium low conical; oil tubes solitary in all the intervals.

Type locality, "East and West Humboldt Mountains, California, and in Ruby Valley, Nevada;" collected by *Watson*, no. 456, in 1868; type in U. S. Nat. Herb.

An aquatic in the mountains of northeastern California, northern Nevada, and southern Idaho.

Specimens examined:

CALIFORNIA: West Humboldt Mountains, *Greene*, July 21, 1894.

NEVADA: Ruby Valley, altitude 1,800 meters, *Watson* 456, August, 1868.

IDAHO: Near Shoshone Falls, Snake River, *Henderson* 4596, July 26, 1897.

10. **Angelica roseana** Henderson, Contr. Nat. Herb. **5**: 201. pl. 26. 1899.

PLATE VI.

Low and very stout, 5 to 6 dm. high, with glabrous and usually purplish stems, and more or less scabrous inflorescence; leaves twice or thrice ternate then pinnate; upper stem leaves reduced, with large inflated petioles; leaflets broadly ovate to lanceolate, thick, with prominent veins, laciniately mucronate-toothed, 2.5 to 3.5 cm. long, obtuse or acute, glabrous or more or less scabrous; umbels with very unequal rays, no involucre (or sometimes 1 or 2 bracts), and involucels of few filiform and very scabrous bractlets; flowers greenish or tinged with purple; ovaries glabrous or puberulent; fruit broadly oblong-elliptic, more or less scabrous, 4 to 5 mm. long; dorsal and intermediate ribs often nearly as prominent as the lateral, thick and corky; stylopodium conical; oil tubes mostly solitary in the intervals.

Type locality, "banks of dried, gravelly rills, foothills of the Lost River Mountains [near Salmon], Fremont County, Idaho;" collected by *Henderson*, no. 4065, August 15, 1895; type in U. S. Nat. Herb.

Mountains of Idaho and adjacent Montana, Wyoming, and Utah.

Specimens examined:

IDAHO: Type specimens as cited under type locality; Salmon River, near Yankee Fork, *Henderson* 3809, August 1, 1895; Mount Chauret, boundary between Idaho and Montana, *Rydberg* 4605, July 27, 1897.

MONTANA: Lone Mountain, *Tweedy* 1056, August, 1889; near Boulder Creek, Bitter Root Forest Reserve, altitude 1,820 meters, *Leiberg* 3003, September 17, 1897.

WYOMING: Little Goose Canyon, *Nelson* 2355, July 15, 1896; Sierra Madre, Carbon County, *Nelson* 3493, August 16, 1897; Teton Mountains, *A. & E. Nelson* 6500, August 16, 1899; Big Horn Mountains, Sheridan County, *Tweedy* 2431, August, 1899.

UTAH: Uinta Mountains, altitude 3,000 meters, *Watson* 459, August, 1869 (distributed as *Archangelica gmelini*).

EXPLANATION OF PLATE VI.—Fig. *1*, umbel; *2*, leaf; *3*, dorsal view of carpel; *4*, cross section of carpel.

11. **Angelica leporina** Watson, Proc. Am. Acad. **12**: 252. 1877.

Tall and rather slender, 6 to 9 dm. high, glabrous; leaves bipinnate; leaflets linear to broadly lanceolate, acuminate, coarsely or laciniately toothed to entire, 2.5 to 7.5 cm. long; umbel very unequally 10 to 25-rayed, with neither involucre nor involucels (or with a few deciduous bractlets); rays somewhat scabrous, 1 to 7.5 cm. long; pedicels 4 to 6 mm. long; fruit glabrous, very small, about 3 mm. long; dorsal and intermediate ribs prominent; lateral wings narrower than body; oil tubes solitary in the intervals, or the lateral in pairs.

Type locality, damp soil, "Rabbit Valley, [Southern] Utah," altitude 2,010 meters; collected by *L. F. Ward*, no. 612, August 18, 1875; type in U. S. Nat. Herb.

Southern Utah.

Specimens examined:

UTAH: Type specimens as cited under type locality; southern Utah, *Palmer* 183, in 1877; Cottrell's Ranch (altitude 1,800 meters), Mount Ellen, Henry Mountains (altitude 3,000 meters), and Elk Ranch (altitude 2,100 meters), *Jones* 5658, 5684, 6039, July–September, 1894.

12. **Angelica lineariloba** Gray, Proc. Am. Acad. **7**: 347. 1868.

Stout, glabrous, 6 to 9 dm. high; leaves twice or thrice quinate; leaflets linear, 2.5 to 10 cm. long, cuspidately acuminate, entire or the lower ones 3-parted with the decurrent sometimes coarsely toothed lobes divaricate; umbels with neither involucre nor involucels; rays 2.5 to 5 cm. long; fruit oval-oblong, glabrous, 8 mm. long, 4 mm. broad; dorsal and intermediate ribs filiform; lateral wings thickish, a little narrower than the body; oil tubes solitary in the dorsal intervals, in pairs in the laterals.

Type locality, "Ostrander's Meadows, Yosemite Valley," California, altitude 2,400 meters; collected by *Bolander;* type in Herb. Gray.

Sierra Nevada of southern California.

Specimens examined:

CALIFORNIA: "Southern Sierras," altitude 2,850 meters, *Rothrock* 355, September, 1875; near Mineral King, Sierra Nevada (Tulare County), altitude 2,750 meters, *Coville & Funston* 1479, August 4, 1891.

13. **Angelica californica** Jepson, Erythea **1**: 8. 1893.

Stems about 12 dm. high, glabrous, with puberulent inflorescence and leaves; leaves once or twice ternate then once or twice pinnate; leaflets ovate, about 5 cm. long, the terminal one mostly 3-lobed, the lower often lobed or divided at base, all irregularly serrate with mucronulate teeth; umbel with numerous unequal rays, and neither involucre nor involucels; rays 2.5 to 15 cm. long; pedicels about 6 mm. long; fruit oblong, 8 to 9 mm. long, glabrous, with winged dorsal and intermediate ribs, and lateral wings not as broad as body; oil tubes mostly 3 in the intervals.

Type locality, "Gates Canyon, Vaca Mountains," California; collected by *Jepson*, June 20, 1892; type in Herb. Univ. Calif.

Central California, in the bay region.

Specimens examined:

CALIFORNIA: Sausalito, Marin County, *G. R. Vasey*, in 1875.

14. **Angelica curtisii** Buckley, Am. Jour. Sci. **45**: 173. 1843.

Glabrous, 6 to 9 dm. high; leaves twice ternate or the divisions pinnate, the uppermost mostly reduced to large inflated petioles; leaflets thin, ovate-lanceolate (2.5 to 7.5 cm. broad), sharply and irregularly toothed; umbel somewhat pubescent, equally 15 to 25-rayed, with no involucre but with involucels of subulate bractlets; rays 5 to 7.5 cm. long; pedicels 8 to 12 mm. long; fruit broadly oblong, glabrous, 4 to 8 mm. long, emarginate at base; dorsal and intermediate ribs acute and prominent, often somewhat winged; lateral wings thin, broader than body; oil tubes mostly solitary in the intervals, sometimes 2 or 3.

Type locality, "high mountains of North Carolina, especially the Bald Mountain in Yancey County;" collected by *M. A. Curtis;* type in Herb. Gray.

In the Alleghanies from Pennsylvania to North Carolina.

Specimens examined:

PENNSYLVANIA: Burgoon Gap, Blair County, *Porter, Lowrie, Garber*, September 17, 1869.

VIRGINIA: Peaks of Otter, Bedford County, altitude 1,200 meters, *A. H. Curtiss*, August 28, 1880; Salt Pond Mountain, *Canby* 92, August, 1890.

NORTH CAROLINA: Roan Mountain, altitude 1,710 meters, *Chickering*, August 5, 1880; same station, altitude 1,800 to 1,900 meters, *Merriam*, September 9–11, 1892.

15. **Angelica canbyi** C. & R. Rev. N. Am. Umbell. 40. 1888.

Glabrous throughout except the puberulent inflorescence, 6 to 9 dm. high; leaves bipinnate; leaflets linear to ovate, 2.5 to 5 cm. long, acute or acuminate, laciniately toothed; umbel rather equally 10 to 20-rayed, with neither involucre nor involucels; rays 2.5 to 5 cm. long; pedicels slender, 6 to 8 mm. long, glabrous or nearly so; flowers pinkish; fruit oblong, glabrous at maturity (densely puberulent when young), 6 mm. long; dorsal and intermediate ribs thin and very prominent, somewhat winged; lateral wings rather thin, half as broad as body; stylopodium conical; oil tubes solitary in dorsal intervals, in pairs in the laterals.

Type locality, "low grassy ground along streams, Klickitat River, near Mount Adams," Washington; collected by *W. N. Suksdorf*, no. 763, flower June 26, fruit August, 1885; type in Herb. Coulter.

Eastern Washington.

Specimens examined:

WASHINGTON: *Brandegee* 796, August, 1883; type specimens as cited under type locality; *G. R. Vasey* 301, 461, in 1889; *Sandberg & Leiberg* 420 in part, in 1893; Blue Mountains, Wallawalla County, *Piper* 2335, July 15, 1896; same station, *Horner* 218, 219, July–September, 1897.

16. **Angelica breweri** Gray, Proc. Am. Acad. **7**: 348. 1868.

Glabrous or somewhat puberulent (especially in the inflorescence), 9 to 12 dm. high; leaves ternate or quinate then pinnate; leaflets lanceolate or oblong-lanceolate, acuminate, 5 to 12.5 cm. long, sharply serrate with cuspidate teeth, the lower sometimes lobed at base; umbel many-rayed, with neither involucre nor involucels (or with a few deciduous bractlets); rays 5 to 7.5 cm. long; pedicels 4 to 8 mm. long; stylopodium conical, with long style; fruit oblong or somewhat narrowed below, pubescent or becoming glabrous, 5 to 10 mm. long; dorsal and intermediate ribs more or less prominent; lateral wings narrow and as thick as the flattened body; oil tubes 1 or 2 in the intervals.

Type locality, "Sierra Nevada, near Ebbetts Pass," Alpine County, Cal.; collected by *Brewer;* type in Herb. Gray. Associated with it in the original description are *Brewer* "on the Big-tree road," and *Torrey* "near Donner Lake."

Mountains of eastern California and adjacent Nevada.

Specimens examined:

CALIFORNIA: Pine Grove, Amador County, altitude 660 meters, *Hansen* 326, June 3, 1894; mountains near Yosemite, *Canby*, August 16, 1895.

NEVADA: East Humboldt Mountains, altitude 2,400 meters, *Watson* 457, August, 1868.

The Californian material has fruit 9 to 10 mm. long, while the fruit of Watson's Nevada specimens is but 5 to 6 mm. long.

17. **Angelica wheeleri** Watson, Am. Nat. **7**: 301. 1873.

Tall and stout, rough puberulent; leaves biternate; leaflets ovate-oblong, 5 to 7.5 cm. long, acute, incisely serrate, the teeth broad and mucronulate, middle leaflet petiolulate; umbel unequally many-rayed, with neither involucre nor involucels; rays becoming 5 to 13 cm. long; pedicels and ovary hispid; fruit broad-elliptical, 6 mm. long, somewhat pubescent; the dorsal and intermediate ribs thick, narrower than the thick lateral ones; oil tubes solitary in the dorsal intervals, in pairs in the laterals.

Type locality, "Utah;" collected by *Wheeler;* type in Herb. Gray, duplicate in U. S. Nat. Herb.

We have seen only the type specimens, and the plant seems not to have been collected since.

18. **Angelica villosa** (Walt.) B. S. P. Prel. Cat. N. Y. 22. 1888.

Ferula villosa Walt. Fl. Car. 115. 1788.
Angelica hirsuta Muhl. Cat. ed. 2. 30. 1818.
Archangelica hirsuta Torr. & Gray Fl. **1**: 622. 1840.
Archangelica villosa Kuntze, Rev. Gen. Pl. **1**: 265. 1891.

Tomentose above, 6 to 15 dm. high; leaves twice or thrice pinnately or ternately divided, the uppermost mostly reduced to large inflated petioles; leaflets thickish, lanceolate to oblong, 1 to 2.5 cm. broad, serrate; umbel equally many-rayed, with no involucre, and involucels of linear bractlets; rays 2.5 to 5 cm. long; pedicels 4 mm. long; fruit nearly round, pubescent, 4 mm. in diameter; dorsal and intermediate ribs prominent; lateral wings thin, as broad as body; stylopodium small, low conical; oil tubes 3 to 6 in the intervals (sometimes 1 or 2), 6 to 10 on the commissural side.

Type locality not given, but presumably in the Carolinas; type in Herb. Brit. Mus.

Dry soil, Connecticut to Florida and west to Minnesota, Missouri, and Mississippi.

Specimens examined:

CONNECTICUT: Near Westport, *Pollard* 198, July 18, 1894.

NEW YORK: Ithaca, *Coville*, August 8, 1885; Junius, *Rowlee*, August 4, 1893; Van Cortlandt Park, New York City, *Pollard*, June, 1893.

PENNSYLVANIA: Delaware County, near Cold Springs, *Small*, August 7, 1889; Lancaster County, *Heller* 552, September 6, 1892.

NEW JERSEY: Near Clifton, Passaic County, *Nash*, August, 1891 and 1892; near Stockholm, Sussex County, *Van Sickle*, July, 1894.

MARYLAND: Woodside, *Pollard* 691, September 20, 1895.

DISTRICT OF COLUMBIA: Zoological Park, *Pollard* 521, July 26, 1895.

VIRGINIA: *Ball*, September, 1884; Salt Pond Mountain, *Canby*, August, 1890; Pittsylvania County, *Heller* 1103, July 20, 1893.

WEST VIRGINIA: Upshur County, *Pollock*, July 29, 1895.

NORTH CAROLINA: Near Biltmore, *Bilt. Herb.* 1327, August 12, 1896; Tryon, Polk County, *Townsend*, August 4, 1897.

SOUTH CAROLINA: Aiken, *Ravenel*, June, 1869.

TENNESSEE: Cocke County, *Kearney* 705, September 11, 1897; near Knoxville, *Ruth* 419, June, 1898.

MISSISSIPPI: Waynesboro, Wayne County, *Pollard* 1246A, August 8–9, 1896.

MISSOURI: Eagle Rock, *Bush* 16, June 26, 1897.

ILLINOIS: *Vasey.*

19. **Angelica atropurpurea** L. Sp. Pl. **1**: 251. 1753.

Angelica triquinata Michx. Fl. Bor. Am. 1: 167. 1803.
Archangelica atropurpurea Hoff. Umbel. 162. 1814.

Very stout, smooth, with dark purple stem, 12 to 18 dm. high; leaves ternate then pinnate; leaflets ovate to lanceolate, 2.5 to 7.5 cm. long, sharply cut mucronate-serrate; umbel more or less puberulent, equally 15 to 25-rayed, with no involucre, and involucels of few short subulate bractlets; rays 2.5 to 7.5 cm. long; pedicels 10 to 16 mm. long; fruit oblong, glabrous, 6 mm. long; dorsal and intermediate ribs very prominent, lateral wings thin, about half as broad as body; stylopodium low conical; oil tubes 25 to 30 and continuous, 8 to 10 of them on the commissural side.

Type locality, "Canada."

Low river banks, from Labrador to Delaware, and west to Illinois and Minnesota.

Specimens examined:

VERMONT: Alpine region of the White Mountains, *Oakes;* Sunderland, *M. A. Day* 88, July 6, 1898.

MASSACHUSETTS: Topsfield, *Oakes*.
CONNECTICUT: Milford, *Eames*, June–August, 1893 and 1895.
NEW YORK: Ithaca, *Univ. Coll.*, July–September, 1875.
PENNSYLVANIA: Westmoreland County, *Pierron*, October 3, 1877.
MICHIGAN: Alma, *Davis*, June 29, 1891.
ILLINOIS: *Brendel*, in 1873; Lisle, Dupage County, *Umbach*, June 8, 1898.
MINNESOTA: Winona, *Holzinger*, July, 1888; Fort Snelling, *Mearns*, June 25, 1891.

20. **Angelica ampla** A. Nelson, Bull. Torr. Bot. Club **25**: 375. 1898.

Tall and stout, 15 to 25 dm. high, with purplish glabrous stems and puberulent inflorescence; leaves large, ternate then twice pinnate; leaflets ovate to obovate, short acuminate, serrate or toothed, 5 to 20 cm. long; umbels with very numerous nearly equal rays, no involucre, and usually involucels of setaceous bractlets; rays 5 to 10 cm. long; pedicels 10 to 12 mm. long; fruit broadly oblong, glabrous, 5 to 7 mm. long, the dorsal and intermediate ribs sharp (hardly winged), narrower than the thin very narrow lateral wings; oil tubes small and numerous, contiguous about the seed and adhering to it with the breaking down of the pericarp.

Type locality, "Sand Creek [Wyoming], near the Colorado line;" collected by *Aven Nelson*, no. 2046, in 1896; type in Herb. Nelson, duplicate in U. S. Nat. Herb. Associated with the type in the original description is *Nelson* 3460, in 1897, from Laramie River, near Jelm Mountain.

From southeastern Wyoming to the Pikes Peak region of Colorado.

Specimens examined:

WYOMING: Near Sherman, Albany County, altitude 2,400 meters, *Letterman* 221, July 29, 1884; type specimens as cited under type locality.
COLORADO: *Hall & Harbour* 219, in 1862; near Crested Butte, *Alice Eastwood*, in 1891; Colorado Springs and Central City, *Alice Eastwood*, September–October, 1892; South Park, *Cowen* 30, August 28, 1896.

21. **Angelica dentata** (Chapman) C. & R. Bot. Gazette **12**: 61. 1887.

Archangelica dentata Chapman in Torr. & Gray Fl. **1**: 622. 1840.

Slender, glabrous, 3 to 9 dm. high; leaves ternate, with long slender petioles and few leaflets, which are small, 1 to 2.5 cm. long, lanceolate, coarsely toothed or lobed; umbel slightly pubescent, equally 5 to 10-rayed, with no involucre, and involucels of subulate bractlets; rays about 2.5 cm. long; pedicels 6 to 8 mm. long; fruit broadly oblong, glabrous or pubescent, 5 mm. long; dorsal and intermediate ribs more or less prominent; lateral wings thin, as broad as body; oil tubes about 20 and continuous about the seed.

Type locality, "sandy pine barrens, Gadsden County, middle Florida;" collected by *Chapman;* type in Herb. Gray.

Dry pine barrens of Florida.

Specimens examined:

FLORIDA: *Chapman;* Aspalaga, *Curtiss* 1014, in 1880; Carrabelle, Franklin County, *Bilt. Herb.* 959, October, 1890.

48. GLEHNIA F. Schmidt in Miq. Ann. Mus. Bot. Lugd. Bat. 3: 61. 1867.

Phellopterus Benth. in Benth. & Hook. Gen. Pl. 1: 905. 1867. Not Nuttall.

Calyx teeth small. Fruit globose, glabrous. Carpel somewhat flattened dorsally, with 5 equal broad and corky thickened wings; lateral wings distinct from those of the other carpel; pericarp with no strengthening cells. Stylopodium depressed. Oil tubes 2 or 3 in the intervals (but appearing evenly distributed, owing to the narrowness of the intervals), 4 to 6 on the commissural side. Seed face slightly concave.

Low tomentose-villous herbs on the sands of the seashore, with once or twice ternate or ternate-pinnate coriaceous leaves, ovate to roundish more or less confluent leaflets densely white tomentose beneath, involucre and involucels of subulate bracts, and glomerate whitish flowers.

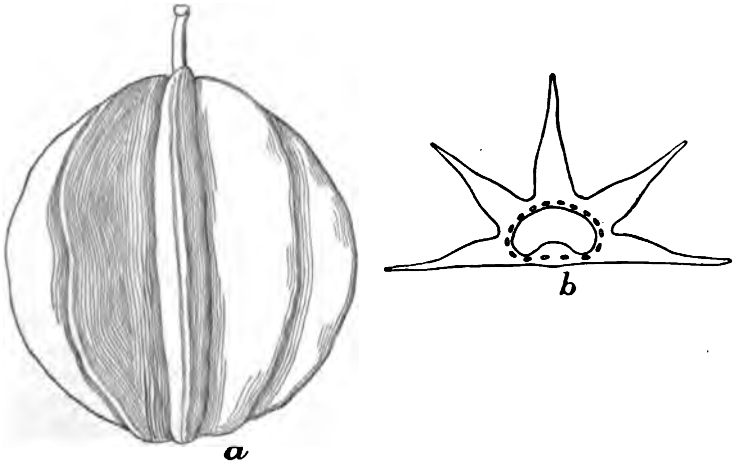


FIG. 49.—Glehnia littoralis: *a*, *b*, × 4.

A monotypic genus (based on *Cymopterus* (?) *littoralis* Gray) belonging to the American and Asiatic coasts of the northern Pacific.

1. **Glehnia littoralis** (Gray) Schmidt, l. c. FIG. 49.

Cymopterus (?) *littoralis* Gray, Pacif. R. Rep. Bot. **12²**: 62. 1860.
Phellopterus littoralis Schmidt, Mem. Acad. Petrop. VII. **12**: 138. 1868.

Subcaulescent; petioles elongated; leaflets callous-serrate to dentate, with impressed veinlets above, 2.5 to 5 cm. long; umbels shorter than the leaves, 10 to 12-rayed; rays 12 to 24 mm. long; umbellets capitate; fruit 8 to 10 mm. in diameter, the wings 3 mm. broad.

Type locality, "on the sands of the seashore at Shoalwater Bay," Puget Sound; collected by *Cooper;* type in Herb. Gray.

Sandy seashores from Oregon to Alaska; also in Korea and Japan.

Specimens examined:

OREGON: Tillamook Bay, *Howell*, July 14, 1882; mouth of Umpqua River, *Howell*, June 18, 1885.

WASHINGTON: Puget Sound, *Wilkes Exped.* 5; Westport, Chehalis County, *Henderson* 385, June 26, 1892.

BRITISH COLUMBIA: Oak Bay, Vancouver Island, *Macoun*, June 18, 1887.

ALASKA: Ankow River, near Ocean Cape, vicinity of Yakutat Bay, *Funston* 51, July 1, 1892.

The plant scarcely rises above the surface of the shifting sands, the leaves lying prostrate.

For *Cymopterus* (?) *littoralis* Gray it is usual to cite Mem. Am. Acad. 6 : 391. 1859. This publication, however, is a *nomen nudum*, and refers to the Pacific Railway Report (at that time unpublished) cited above as the place of publication.

49. PHELLOPTERUS Nutt. in Torr. & Gray Fl. 1: 623. 1840.

Calyx teeth evident. Fruit oblong to orbicular in outline, glabrous. Carpel with 3 to 5 broad wings, thin throughout or slightly thickened at insertion, the laterals distinct from those of the other carpel. Stylopodium wanting. Oil tubes usually more than one in the intervals, 4 to 8 on the commissural side. Seed more or less dorsally flattened, the face with a shallow and broad concavity.

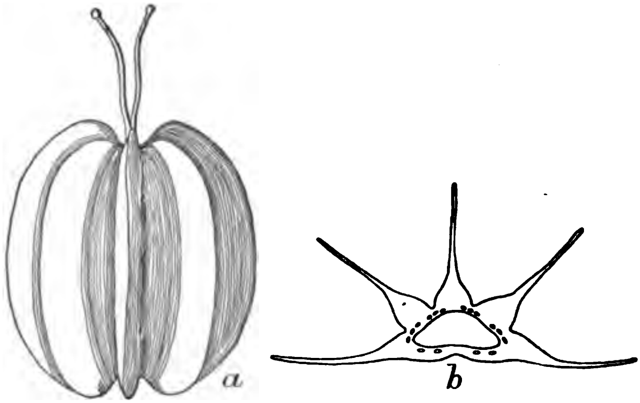


FIG. 50.—Phellopterus montanus: *a*, × 4; *b*, × 6.

Acaulescent or short caulescent plants, with pale once or thrice pinnate leaves (segments usually short, broad, crowded, and more or less confluent), mostly conspicuous and similar more or less hyaline involucre and involucels, and purple flowers (except in *P. montanus*).

First species cited, *Phellopterus montanus* Nutt., under *Cymopterus montanus* Torr. & Gray.

A genus of five species, belonging to the plains and mountains of western United States.

Flowers white .... 1. *P. montanus.*

Flowers pinkish or purple.

Involucels with bractlets lacerate-fringed at apex .... 2. *P. macrorhizus.*

Involucels with entire bractlets.
  Involucre mostly conspicuous; bracts and bractlets 1 to 3-nerved.
    Fruit oblong, 8 mm. long .... 3. *P. bulbosus*.
    Fruit orbicular, 10 to 12 mm. long .... 4. *P. purpurascens*.
  Involucre mostly a low hyaline sheath; bracts and bractlets many-nerved.
    5. *P. multinervatus*.

1. **Phellopterus montanus** Nutt. in Torr. & Gray Fl. **1**: 624. 1840. FIG. 50.

Cymopterus montanus Torr. & Gray Fl. **1**: 624. 1840.

Flowering umbels compactly clustered at the base of the rosette of much longer leaves, often appearing sessile, somewhat elongated in fruit; involucre inconspicuous, hyaline and lobed, sometimes reduced to a cup; involucels conspicuous, the bractlets distinct, obovate, entire, with very broad white and hyaline margins, with more or less distinct green central region; pedicels shorter than the bractlets; flowers white, sometimes purplish; fruit broadly oblong to nearly orbicular, 6 to 8 mm. long, with broad thin wings somewhat thickened at insertion; oil tubes 1 to 3 in the intervals, 4 to 8 on the commissural side; seed somewhat flattened, with broadly concave face.

Type locality, "high bare plains of the Platte, toward the Rocky Mountains;" collected by *Nuttall;* type in Herb. Philad. Acad.

Open plains of Colorado, Arkansas, Wyoming, Kansas, Nebraska, and South Dakota.

Specimens examined:

COLORADO: Type specimens as cited under type locality; *Hall & Harbour* 210, in 1862; Pueblo, *Hicks*, June 8, 1890; near Denver, *Alice Eastwood*, in 1891; near Windsor, *Osterhout*, May, 1895; near Denver, *Bethel*, May, 1895, and June, 1898; Fort Collins, *Crandall*, May 30, 1896; near Denver, *Holzinger*, May–June, 1896; Colorado Springs, *Rydberg*, May 9, 1900.

WYOMING: Fort Russell, *Ruby*, May, 1885; Laramie Plains, *Nelson*, May, 1893 and 1894.

SOUTH DAKOTA: Black Hills, *Rydberg* 726, June 14, 1892.

NEBRASKA: Deuel County, *Rydberg*, June 27, 1891.

KANSAS: Spearsville, Ford County, *Wentz*, April, 1886; Atwood, *Fry*, April 18, 1891.

ARKANSAS: Fort Lyon, *Palmer*, April 9, 1863.

2. **Phellopterus macrorhizus** (Buckley) C. & R.

Cymopterus macrorhizus Buckley, Proc. Philad. Acad. 1861: 455. 1862.
Cymopterus montanus pedunculatus Jones, Proc. Calif. Acad. Sci II. **5**: 686. 1895.

Resembling *P. montanus*, but peduncles elongated, in fruit becoming twice as long as the leaves; umbels open, with longer unequal rays and longer pedicels; involucels of distinct usually obovate bractlets, with one to several nerves, and lacerate-fringed at apex; flowers pinkish; fruit smaller, 4 mm. long.

Type locality, "prairies north of Austin," Tex.; collected by *Buckley*, March, 1860; type in Herb. Philad. Acad.

Northeastern Texas.

Specimens examined:

TEXAS: *Mex. Bound. Surv.;* type specimens as cited under type locality; Belknap, *Sutton Hayes* 309; Dallas, *Woolson*, in 1873 (type of *Cymopterus montanus pedunculatus* Jones); Dallas, *Reverchon*, in 1874 and 1880; Shackelford County, *Holstein*, in 1883; Dallas, *Reverchon*, February 26, 1900.

This species is restricted to the prairie region of northeastern Texas, and is quite distinct in range from *P. montanus*, to which it has been referred. Mr. Reverchon has sent us living specimens from Dallas with the following note: "This species occurs on the limestone prairies of north Texas (how far south I do not know). It grows where the rocks crop out, and blooms quite early; in fact, it is the first bloomer I know of in Texas, sometimes appearing about Christmas when the winter is open."

3. **Phellopterus bulbosus** (A. Nelson) C. & R.

Cymopterus bulbosus Nelson, Bull. Torr. Bot. Club **26**: 241. 1899.

Leaf segments more crowded than in *P. montanus;* flowering umbel more elongated, in fruit equaling or exceeding the leaves; involucre conspicuous, of broad hyaline bracts united at base; involucels more conspicuous, the broad hyaline bracts sometimes with a greenish central region; pedicels longer than in *P. montanus;* flowers purplish; fruit oblong, much narrower than in *P. montanus*, 8 mm. long, with broad thin wings not thickened at insertion; oil tubes 3 to 5 in the intervals, 6 to 10 on the commissural side; seed face with rather deep and broad concavity.

Type locality not given, but label states "naked clay soil in the ravines and on the slopes of Green River," Wyoming; collected by *A. Nelson*, no. 4709, June 14, 1898; type in Herb. Univ. Wyoming, duplicate in U. S. Nat. Herb.

Green River region of Wyoming.

Specimens examined:

WYOMING: Green River, *Parry* 117, in 1873; La Barge, Uinta County, *Stevenson* 40, April 27, 1894; Point of Rocks, Sweetwater County, *Nelson* 3085, June 1, 1897; type specimens as cited under type locality.

4. **Phellopterus purpurascens** (Gray) C. & R.

Cymopterus montanus purpurascens Gray, Bot. Ives 15. 1860.
Cymopterus utahensis Jones, Calif. Acad. Sci. II. **5**: 684. 1895.
Cymopterus utahensis monocephalus Jones, l. c. 685.

Peduncles longer than in *P. montanus*, in fruit equaling or exceeding the leaves; umbels more or less compacted; involucre conspicuous, composed of white or purplish hyaline bracts which have 1 to 3 green or purplish nerves and are united at base, or sometimes reduced to a hyaline sheath; involucels resembling the involucres; flowers purple; fruit orbicular, with broad wings and oblong body, 10 to 12 mm. long; carpels somewhat flattened, with 5 broad thin wings scarcely thickened at insertion; oil tubes 2 or 3 in the intervals, 4 on the commissural side; seed somewhat flattened, with broadly concave face.

Type locality, "Yampai Valley to San Francisco Mountains;" collected by *Newberry;* type specimen in U. S. Nat. Herb.

In clay or gravel, New Mexico, Arizona, Utah, Nevada, and Idaho.

Specimens examined:

NEW MEXICO: Oryabe, *Newberry*, April and May, 1858; Fort Wingate, *Marsh*, May 24, 1883; Barranca, Taos County, *A. A. & E. Gertrude Heller*, May 26, 1897.

ARIZONA: Top of grade above Pagumpa, *Jones* 5098, April 23, 1894; near Black Rock Spring, *Jones* 5098*h* and 5098*p*, April 23, 1894 (types of *C. utahensis* Jones).

UTAH: *Palmer*, 1869; Grass Valley, *Lester F. Ward* 25, May 12, 1875; Terminus, May and June, and Cisco, May 2, 1890, *Jones*.

NEVADA: Trinity Mountains, *Watson* 449 as to fruit, May, 1868; Candelaria, *Shockley*, April, 1885.

IDAHO: Near Pocatello, *Palmer* 11, May 20, 1893.

While certain specimens show umbels so compact as to form globose heads in fruit, having suggested to Mr. Jones his var. *monocephalus*, we find that this is too variable a character to permit separation.

Phellopterus purpurascens eastwoodae (Jones) C. & R.

Cymopterus utahensis eastwoodae Jones, Calif. Acad. Sci. II. **5**: 685. 1895.

More robust, 2 to 3 dm. high, with usually long peduncles; umbels and umbellets more open, with prominent rays and pedicels; wings of fruit much narrower, resulting in a narrow fruit; more eastern in range.

Type locality, "Durango, Colorado;" collected by *Alice Eastwood*; type specimen in U. S. Nat. Herb.

Colorado.

Specimens examined:

COLORADO: Durango, *Alice Eastwood*, June, 1890 and 1891; Gunnison, *Bethel* 22, June 27, 1898; Pueblo, *Rydberg*, May 14 and 15, 1900.

5. **Phellopterus multinervatus** C. & R., sp. nov.

Cymopterus purpurascens Jones, Calif. Acad. Sci. II. **5**: 687. 1895. Not Gray.

Peduncles as in *P. purpurascens;* involucre a low hyaline more or less lobed sheath, or developing one or more conspicuous bracts resembling those of the involucel; involucels conspicuous, composed of broad purplish bractlets united at base, which are rounded at apex, many-nerved, and with narrow hyaline margins; flowers purple; fruit orbicular, with very broad wings and oblong body, 12 to 15 mm. long; carpels somewhat flattened, with 5 broad thin wings somewhat thickened at insertion; oil tubes 2 to 4 in the intervals, 8 on the commissural side; seed somewhat flattened, with broadly concave face.

Type locality, Peach Springs, northern Arizona; collected by *Mr. and Mrs. J. G. Lemmon*, May, 1884 (distributed as *Cymopterus montanus*); type specimen in U. S. Nat. Herb.

In clay and gravel, New Mexico, Arizona, Utah, and possibly California.

Specimens examined:

ARIZONA: Peach Springs, *Lemmon*, May, 1884; San Francisco Mountains, *MacDougal* 150, June, 1891; *Mrs. E. Shuttleworth*, in 1893; Fort Huachuca, *Ebert*, in 1895.

NEW MEXICO: Mangus Springs, *Rusby*, in 1880; Carrizallilo Mountains, *Mearns* 38, April 17, 1892.

UTAH: *Bishop* 29, in 1872; Uinkaret Mountains, *Mrs. Thompson*, in 1872; near Bellevue, *Jones* 5002, March 30, 1894; Washington, *Jones* 5140*c*, May 1, 1894; Laverken, *Jones* 5196*m*, May 8, 1894.

NEVADA: Mount Sabb, Palmetto Range, altitude 2,700 to 3,000 meters, *Purpus* 5866, in 1898.

CALIFORNIA: *Whipple*, in 1853–54.

Mr. Marcus E. Jones recognized and defined this species, but regarded it to be the same as *Cymopterus montanus purpurascens* Gray. An examination of the type specimen of Gray's variety, however, shows it to be the same as *C. utahensis* Jones. It is necessary, therefore, to refer Mr. Jones's *C. utahensis* to our *P. purpurascens* and to give a new name to his *C. purpurascens*.

50. **PTERYXIA** Nutt. in Torr. & Gray Fl. 1: 624. 1840.

Calyx teeth evident. Fruit oblong to orbicular in outline, glabrous. Carpel usually strongly flattened dorsally, with wings thin throughout, lateral ribs with broad wings, dorsal and intermediates from strongly ribbed to broadly winged. Stylopodium wanting. Oil tubes several in the intervals. Seed face plane or with a shallow and broad concavity.

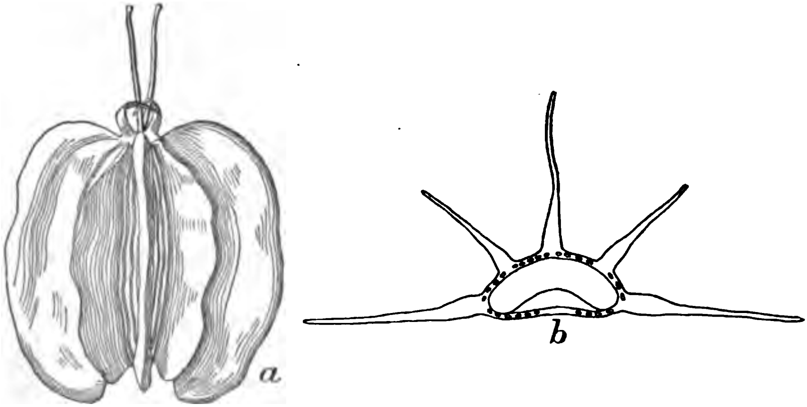


FIG. 51.—Pteryxia terebinthina: *a*, × 4; *b*, × 6.

Plants of acaulescent habit or nearly so, and clothed at base with persistent leaf sheaths, with bright green or somewhat pale leaves clustered at base with main divisions ternate then pinnately finely dissected into short linear more or less pungent segments (not so crowded or confluent as in *Phellopterus*), mostly no involucre, involucels of narrow bractlets (not at all hyaline), and yellow flowers (except in *P. albiflora*).

First species cited, *Pteryxia terebinthina* (*Selinum terebinthinum* Hook. Fl. Bor. Am. 1: 266. 1834).

A genus of at least 7 species, belonging to northwestern United States, from Wyoming to California, Oregon, and Washington.

The species of *Pteryxia* are very difficult of discrimination, and much of the material we have cited in connection with the types is in no condition to determine accurately. There remains in herbaria considerable material which we have not attempted to refer, as it will need to be elucidated by further collections and field observations.

Flowers yellow.
Leaves with pale, narrow, and rigid segments.................. 1. *P. terebinthina.*
Leaves with segments greener and not so rigid.
Leaves of broad outline.
Low (1 to 3 dm.).
Dorsal ribs with broad wings.......................... 2. *P foeniculacea.*
Dorsal ribs with narrow wings.......................... 3. *P. thapsoides.*
Taller (4 dm. or more) and stouter.......................... 4. *P. californica.*
Leaves of narrower outline.
Pinnae small and distant.................................. 5. *P. petraea.*
Pinnae larger and more crowded.......................... 6. *P. calcarea.*
Flowers white.. 7. *P. albiflora.*

1. **Pteryxia terebinthina** (Hook.) C. & R. Fig. 51.

Selinum terebinthinum Hook. Fl. Bor. Am. 1: 266. pl. 95. 1834.
Cymopterus terebinthinus Torr. & Gray Fl. 1: 624. 1840.
Pteryxia terebinthacea Nutt. in Torr. & Gray Fl. l. c.

Peduncles elongated, reaching 4 dm., considerably exceeding the leaves; leaves with ultimate segments pale, rigid, small and narrow, acute and mucronate, entire or toothed; umbels with unequal rays, no involucre, and involucels of linear acuminate bractlets; rays 1 to 4.5 cm. long; fruiting pedicels 4 to 7 mm. long; flowers yellow; fruit broadly oblong to nearly orbicular, about 8 mm. long, each carpel with 3 to 5 broad thin undulate crisped wings; oil tubes very small, 4 to 8 in the intervals, 8 to 12 on the commissural side; seed face with broad and shallow concavity.

Type locality, "Sandy grounds of the Wallawallah River, North-West coast of America," eastern Washington; collected by *Douglas.*

Dry ground, eastern Oregon and Washington, at the lower levels.

Specimens examined:

Oregon: John Day River, *Howell,* June, 1880.

Washington: Walla Walla region (type locality), *Nuttall;* loose volcanic soil, Falcon Valley, *Suksdorf,* June–July, 1883; Mount Adams, altitude 1,200 to 1,500 meters, *Suksdorf* 1201, August 10, 1885; dry ground, Yakima County (Prosser and Mount Adams) and Franklin County (Pasco), *Henderson* 380, May–August, 1892; *Sandberg & Leiberg* 230, in 1893.

2. **Pteryxia foeniculacea** Nutt. in Torr. & Gray Fl. 1: 624. 1840.

Cymopterus foeniculaceus Torr. & Gray, l. c.

Resembling *P. terebinthina*, but not so robust, and lower, 1 to 3 dm. high; leaves greener, more finely dissected, and less rigid, the segments narrower and longer; fruit (not seen) said to be as in *P. terebinthina*, but the wings not undulate or scarcely so.

Type locality, "on rocks, Blue Mountains of Oregon;" collected by *Nuttall;* type in Herb. Philad. Acad.

In the mountains of eastern Oregon and Washington, and adjacent Idaho.

Specimens examined:

OREGON: Near Hoover Creek, Gilliam County, altitude 1,390 meters, *Leiberg* 134, June 1, 1894; near Strawberry Butte, Blue Mountains, altitude 2,475 meters, *Coville* 554, July 13, 1896; Logan Valley, Blue Mountains, *Cusick* 1657, June 20, 1897.

WASHINGTON: High ridges of Blue Mountains, Walla Walla County, *Piper* 2340, July 15, 1896; crevices of rocks on hillsides, Wawawai, Whitman County, *Elmer* 770, May, 1897; southeast Washington, *Horner* 224, July 17, 1897.

IDAHO: Cuddy Mountains, *Jones*, July 11, 1899.

3. **Pteryxia thapsoides** Nutt. in Torr. & Gray Fl. **1**: 625. 1840.

Cymopterus thapsoides Torr. & Gray Fl. **1** : 625. 1840.

Short caulescent, peduncles rising 3 dm. high and exceeding the leaves, glabrous; leaves with broad outline, finely dissected, the ultimate divisions small and linear; umbel with 6 to 10 rays, and involucels of linear or setaceous bractlets; rays in fruit 1 to 2.5 cm. long; pedicels 3 to 5 mm. long; flowers yellow; fruit oblong, 5 to 6 mm. long, with lateral wings about half as broad as body, and narrower dorsal and intermediate wings; oil tubes 3 to 5 in the intervals, 8 to 10 on the commissural side; seed much flattened.

Type locality, "rocky places in the Blue Mountains of Oregon;" collected by *Nuttall;* type in Herb. Philad. Acad.

Mountains of eastern Oregon.

Specimens examined:

OREGON: Type specimens as cited under type locality; "rocky subalpine ridges," *Cusick* 1396, July and August, 1886; Union, *Cusick* 1651, in 1897; "from the higher Wallawa Mountains," *Cusick* 2085, August 23, 1898.

4. **Pteryxia californica** C. & R., sp. nov.

Resembling *P. terebinthina*, but somewhat stouter; leaves with broad outline, strongly once or twice ternate then pinnate into larger, ovate to oblong, pinnately toothed or lobed, not so rigid segments; umbels with unequal rays 3 to 7.5 cm. long; fruit broadly oblong, about 6 mm. long, each carpel with 3 to 5 broad thin wings, neither undulate crisped nor thickened at insertion.

Type locality, Sisson, Siskiyou County, Cal.; collected by *H. E. Brown*, in 1897; type in U. S. Nat. Herb.

Mountains of northern California.

Specimens examined:

CALIFORNIA: Type specimen as cited under type locality; the following specimens are apparently the same: Sierra Nevada Mountains, *Lemmon*, in 1875; near Edgwood, Siskiyou County, *Lemmon* 45, June 27, 1889.

5. **Pteryxia petraea** (Jones) C. & R.

Cymopterus petraeus Jones, Contr. to Western Botany no. 8: 32. 1898.

Short caulescent, arising in dense clusters from a branched caudex, which is clothed with old leaf sheaths, 3 dm. high, the peduncles exceeding the leaves, glabrous; leaves with narrow and elongated outline, the small pinnæ distant, either simple or pinnately divided into short narrow segments; umbel with few very unequal rays, and involucels of linear or setaceous bractlets; rays from nearly wanting to 4 cm. long; pedicels unequal, from nearly wanting to 5 mm. long; flowers yellow; fruit narrowly oblong, 4 to 6 mm. long, with lateral wings about half as broad as body, and narrower dorsal and intermediate wings or ribs; oil tubes 3 to 5 in the intervals, about 8 on the commissural side.

Type locality, "Palisade, Nevada;" collected by *M. E. Jones*, June 14, 1882; type in Herb. Jones, fragment in U. S. Nat. Herb.

From Nevada to Idaho and eastern Oregon.

Specimens examined:

OREGON: Cliffs of Steins Mountains, *Cusick* 1255, June, 1885, and same station, no. 1995, July 4, 1898; Alvord Desert, *Leiberg* 2426, June 30, 1896.

IDAHO: Shoshone Falls, *Palmer* 104, June 4, 1893; same station, *Henderson* 4597, July 25, 1897.

NEVADA: Type specimens as cited under type locality.

The Jones plant from Soda Springs, Cal., associated with this species, is probably to be referred to *P. californica.*

6. **Pteryxia calcarea** (Jones) C. & R.

Cymopterus calcareus Jones, Contr. to Western Botany no. 8: 32. 1898.

Short caulescent, giving rise to a tuft of leaves and longer peduncles (occasionally bearing a small leaf); leaves with the ultimate divisions linear; peduncles reaching a height of 2 to 3 dm.; umbel of unequal rays, no involucre, and involucels of small linear bractlets; rays 1 to 3.5 cm. long; pedicels 2 to 4 mm. long; flowers yellow; fruit oblong, 6 to 7 mm. long, the dorsal and intermediate wings sometimes reduced in breadth; oil tubes 3 to 5 in the intervals, 6 or more on the commisural side; seed face with broad and shallow concavity, but in immature specimens sometimes appearing plane.

Type locality, "Green River, Wyoming;" collected by *Jones*, June 23, 1896; type specimen in Herb. Jones, duplicate in U. S. Nat. Herb.

Southwestern Wyoming to eastern Nevada and Oregon.

Specimens examined:

WYOMING: Near Fort Bridger, *Porter*, July 8, 1873 (distributed as *Cymopterus foeniculaceus*); La Barge, Uinta County, *Stevenson*, June 21, 1894; Green River, *Jones*, June 23, 1896; Point of Rocks, *Nelson* 3083, June, 1897; Cokeville, Uinta County, *Nelson* 4643, June 11, 1898.

UTAH: Detroit, *Jones*, June, 1891.

NEVADA: Dutch Mountain, *Jones*, June 12, 1891.

OREGON: Alvord Desert, *Leiberg* 2426, June 30, 1896.

7. **Pteryxia albiflora** Nutt. in Torr. & Gray Fl. **1**: 625. 1840.

Cymopterus albiflorus Torr. & Gray Fl. **1**: 625. 1840.

Low, very leafy at base; leaves pale, the ultimate segments divaricate and often 3-cleft, short, acute; peduncles slender, more or less spreading, 1 to 1.5 dm. high, considerably longer than the leaves; umbels with unequal rays, no involucre, and involucels of several linear bractlets; rays 4 to 12 mm. long; fruiting pedicels 3 mm. long; flowers white; fruit nearly orbicular, 4 mm. long, each carpel with usually 5 more or less undulate wings.

Type locality, "Hills of Bear River [southern Idaho], in the Rocky Mountain range;" collected by *Nuttall;* type in Herb. Philad. Acad.

In the Yellowstone National Park and adjacent Idaho, Wyoming, and Montana.

Specimens examined:

IDAHO: Type specimens as cited under type locality.
WYOMING: Northwestern Wyoming, *Rose* 533, September 7, 1893.
MONTANA: Near Red Lodge, *Rose* 48, July, 1893.

The specimens collected by Rose match exactly with Nuttall's type and with a Nuttall specimen in the Gray Herbarium.

51. **AULOSPERMUM** C. & R., gen. nov.

Calyx teeth evident. Fruit oblong to orbicular in outline, glabrous.

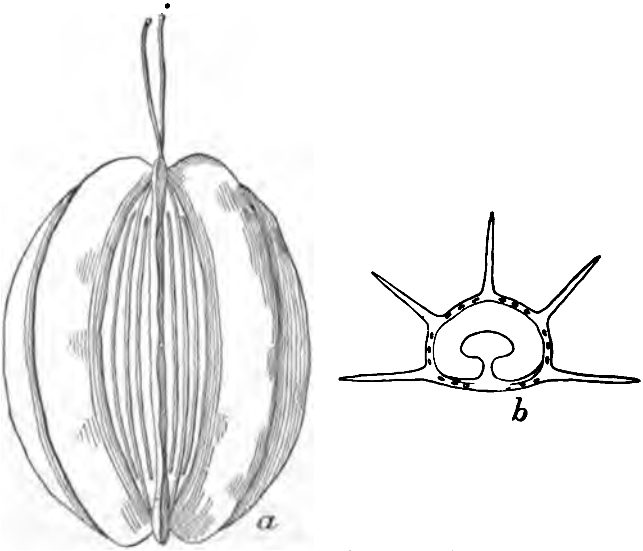


FIG. 52.—Aulospermum longipes: *a, b,* × 8.

Carpel with 3 to 5 usually broad wings, which are very thick at insertion or not at all, and with narrow or broad intervals. Stylopodium wanting. Oil tubes several in the intervals (solitary in *A. jonesii*), two or more on the commissural side. Seed not dorsally flattened or but slightly so, the face usually with a narrow and deep sulcus.

Caulescent or acaulescent plants, with more or less pinnately dissected leaves (or primary division ternate), mostly no involucre, involucels of small narrow bractlets, which are not at all hyaline, and white, yellow, or purple flowers. Name from *αὐλὸς*, *groove*, and σπέρμα, *seed*, referring to the narrow and deep sulcus of the seed face.

Type species, *Cymopterus longipes* Watson, Bot. King Surv. 124. 1871.

A group of 9 species, ranging from Idaho to southern California in the Great Basin region.

The genus *Cymopterus*, with its thick corky wings and very flat seed with plane face, is very different from *Aulospermum*, whose closest affinity is with *Pteryxia*, from which it differs chiefly in its less flattened seed with usually narrow and deep sulcus, and in general in its leaf habit.

The cluster of pinnate leaves and peduncles borne at the summit of a more or less elongated stem, which is conspicuously sheathed at base.
  Flowers yellow.
    Involucre wanting .... 1. *A. longipes.*
    Involucre resembling the involucels .... 2. *A. glaucum.*
  Flowers white.
    Scabrous puberulent .... 3. *A. watsoni.*
    Glabrous and glaucous .... 4. *A. ibapense.*
Leaves clustered at base.
  Wings much thickened at insertion.
    Flowers greenish yellow; fruit 10 mm. long.............. 5. *A. panamintense.*
    Flowers purple; fruit 6 to 8 mm. long.
      Foliage glabrous.. 6. *A. jonesii.*
      Foliage with fine rough pubescence......................... 7. *A. cinerarium.*
  Wings thin at insertion.
    Leaves twice or thrice pinnate.................................. 8. *A. purpureum.*
    Leaves pinnate, with lobed or divided pinnæ .... 9. *A. rosei.*

1. **Aulospermum longipes** (Watson) C. & R. FIG. 52.

Cymopterus longipes Watson, Bot. King Surv. 124. 1871.

Glabrous and glaucous; leaves pinnate to bipinnate, the ultimate segments oval and mucronulate; fruiting peduncles longer than the leaves, 10 to 25 cm. long; umbels 5 to 10-rayed, with no involucre, and involucels of subulate acuminate bractlets; rays 12 to 40 mm. long; pedicels 4 to 6 mm. long; fruit 6 to 8 mm. long, the 5 carpel wings broad and thin, somewhat unequal; oil tubes 3 in the intervals, 6 on the commissural side; seed face with deep and narrow sulcus, which broadens into a central cavity.

Type locality, "Wahsatch Mountains, near Salt Lake City [Utah], and on Antelope Island;" collected by *Watson*, no. 451, May, June, 1869; type in U. S. Nat. Herb.

Utah, northern Colorado, and southwestern Wyoming.

Specimens examined:

UTAH: Wahsatch Mountains, *Watson* 451, in 1869; *Captain Bishop* 25, in 1872: Juab, *Jones*, April 3, 1880; Fairview, *Jones* 5554*e*, June 30, 1894, and 5627*b*, July 13, 1894; Sandy, *Jones*, May 24, 1895; City Creek Canyon, *Jones*, April 4, 1896.

COLORADO: Yampa River, Routt County, *Alice Eastwood*, July 15, 1891.

WYOMING: Piedmont, Uinta County, *Nelson* 4574, 4575, June 7, 1898.

2. **Aulospermum glaucum** (Nutt.) C. & R.

Cymopterus glaucus Nutt. Jour. Philad. Acad. 7: 28. 1834, not Watson in Bot. King Surv.

Phellopterus glaucus Nutt. in Torr. & Gray, Fl. 1: 624. 1840.

Very near to *A. longipes*, but with more finely dissected leaves, involucres resembling the involucels, and the latter of larger and narrower bractlets.

Type locality, "on the borders of the Flat Head River, toward the sources of the Columbia;" collected by *Nuttall;* type in Herb. Philad. Acad. and Herb. Columbia Univ.

Idaho.

Specimens examined:

IDAHO: Near Sawtooth, *Evermann* 526, July 9, 1896; perhaps also Secesh Peak (?), *Henderson* 3180, July 2, 1895.

Various specimens have been referred here, but mostly erroneously. In 1871 Dr. Watson redescribed the species, basing his description upon his own specimens, collected in the mountains of Nevada. Although he states that his specimens accord exactly with Nuttall's type, a careful comparison of the two descriptions shows plainly that they are distinct though related species. Nuttall describes his plant as having smooth and glaucous leaves, yellow flowers, etc., while Watson says the leaf segments are more or less scabrous-puberulent and the flowers are white.

3. **Aulospermum watsoni** C. & R., sp. nov.

Cymopterus glaucus Watson in Bot. King Surv. 124. 1871. Not Nuttall.

More or less scabrous-puberulent; leaves tripinnate, the ultimate divisions crowded, linear-oblong, with revolute margins; peduncles at first short, elongating in fruit and exceeding the leaves; umbels 5 to 15-rayed, with an involucre of setaceous bracts or none, and involucels of linear acute bractlets; rays 8 to 24 mm. long; pedicels 4 to 6 mm. long; fruit 4 to 7 mm. long, the 2 to 5 carpel wings rather narrow; oil tubes 3 to 5 in the broad intervals, 6 to 8 on the commissural side; seed face with narrow sulcus.

Type locality, Battle Mountains, Nevada; collected by *Watson*, no. 450, June, July, 1868; type in U. S. Nat. Herb.

Mountains of Nevada.

Specimens examined:

NEVADA: Battle Mountains, cited under type locality; Palisades, *G. R. Vasey* 229, April, 1880.

4. **Aulospermum ibapense** (Jones) C. & R.

Cymopterus ibapensis Jones, Zoe 3: 302. 1893.

Glaucous and glabrous; leaves tripinnate, the ultimate divisions crowded, oblong, obtuse, with revolute margins; peduncles in fruit exceeding the leaves; umbels with 6 to 8 rays about 1 cm. long in fruit and nearly equal; pedicels 4 mm. long; involucre none; involucels of linear acute bractlets; fruit 4 to 5 mm. long, and carpel with 5 broad thin wings somewhat thickened at insertion; oil tubes 3 in the intervals, 6 on the commissural side; seed face with narrow sulcus.

Type locality, "Deep Creek Valley," Utah; collected by *Jones*, June 6, 1891; type in Herb. Jones, duplicate in U. S. Nat. Herb.

Utah and Nevada.

Specimens examined:

UTAH: Type as cited.

NEVADA: Near Panaca, Lincoln County, *Vernon Bailey* 1974, May 18, 1891; Centerville, June 3, 1893, and Duck Creek, June 30, 1893, *Jones*.

5. **Aulospermum panamintense** C. & R.

Cymopterus panamintensis C. & R. Contr. Nat. Herb. **4**: 116. 1893.

Caudex stout, branching, clothed with an abundance of old leaf sheaths; flowering scape 7.5 to 10 cm. high, glabrous and purplish; leaves finely dissected, ternate, then once or twice pinnate; ultimate segments tipped with a slender bristle-like apiculation; involucre none; involucels small, gamophyllous, somewhat one-sided, purplish, cleft into ovate acuminate segments; rays (in flower) about 12 mm. long; pedicels short; flowers greenish-yellow; fruit 10 mm. long, glabrous, each carpel with 5 broad wings very thick at insertion; oil tubes 3 or 4 in the intervals, 4 on the commissural side; seed face deeply concave.

Type locality, "near Pete's garden, in Johnson Canyon, Panamint Mountains, California;" collected by *Coville*, no. 508, March 30, 1891; type in U. S. Nat. Herb.

Southern California.

Specimens examined:

CALIFORNIA: Panamint Mountains, *Coville* 508, in 1891; Argus Mountains, *Coville & Funston* 739, in 1891; Argus Mountains, *Purpus* 5393, in 1897.

As defined here the species is quite variable in its fruit. Coville's Panamint Mountains specimen is the type, with wings very thick at insertion, and hardly flattened seed with deeply concave face. The two other specimens referred here (*Coville & Funston* 739 and *Purpus* 5393) have the same seed section, but the wings are not so thickened at insertion, if at all. The material in hand, however, does not permit us to separate them. The following form seems to be worthy of separation as a variety, and is fairly intermediate in character between this genus and *Phellopterus*.

Aulospermum panamintense acutifolium C. & R., var. nov.

Leaves more open, with longer segments; fruit smaller, with wings not thickened at insertion; seed face variable, the concavity from broad and shallow to narrow and deep.

Type locality, Newberrys Springs, Mojave Desert, southern California; collected by *Mr.* and *Mrs. J. G. Lemmon*, May, 1884, and distributed as *Cymopterus terebinthinus;* type specimen in U. S. Nat. Herb.

Southern California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

6. **Aulospermum jonesii** C. & R.

Cymopterus jonesii C. & R. Rev. N. Am. Umbell. 80. 1888.

Nearly acaulescent, glaucous and glabrous; leaves ternate, then pinnate to bipinnate, with ultimate segments rather broad and mucronate-toothed; peduncles stout and longer than the leaves, 5 to 13 cm. high; umbels 5 to 12-rayed, with no involucre, and involucels of small lanceolate bractlets somewhat united at base; rays about 2.5 cm. long; pedicels 4 to 6 mm. long; flowers purple; fruit globose, 8 mm. in diameter, each carpel with 5 broad thin wings very thick at insertion; oil tubes solitary in the very narrow intervals, 2 on the commissural side; seed face with deep and narrow sulcus, which broadens into a central cavity.

Type locality, "Frisco," Beaver County, Utah, altitude 2,400 meters; collected by *Jones*, no. 1808, June 22, 1880; type in U. S. Nat. Herb.

Mountains of Utah.

Specimens examined:

UTAH: Type specimens as cited under type locality; Cove Creek, *Jones*, June 16, 1898.

7. **Aulospermum cinerarium** (Gray) C. & R.

Cymopterus cinerarius Gray, Proc. Am. Acad. **6**: 535. 1865.

Acaulescent, with subterranean creeping rootstock; peduncles (5 to 7.5 cm. high) and petioles glabrous; leaves somewhat cordate in outline, bipinnate with toothed segments, glaucous-cinereous with a fine rough pubescence; rays few, short or almost none; flowers purple; involucels of numerous united somewhat membranous long-acuminate segments; fruit 6 mm. long, the 5 wings of each carpel rather narrow and thick at insertion; oil tubes 3 in the intervals, several on the commissural side; seed face with narrow and deep concavity.

Type locality, "in volcanic ashes, on dry hills in the high Sierra Nevada, at Sonora Pass, and above Lake Mono," California, altitude 2,700 to 3,000 meters; collected by *Brewer;* type in Herb. Gray, fragments in U. S. Nat. Herb.

Only known from the type locality and from the original collection.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

8. **Aulospermum purpureum** (Watson) C. & R.

Cymopterus purpureus Watson, Am. Nat. **7**: 300. 1873.

Whole plant purplish, nearly acaulescent, glabrous; leaves broadly triangular in outline, twice to thrice pinnate, the segments coarsely mucronate-dentate; peduncles stout, exceeding the leaves; umbel unequally 8 to 12-rayed, with more or less elongated rays and pedicels, mostly no involucre, and involucels of lanceolate bractlets united near the base and nearly equaling the yellowish-purple flowers; fruit 8 to 10 mm. long, each carpel with 3 to 5 broad wings scarcely thickened at insertion; oil tubes 4 or 5 in the intervals, 8 on the commissural side; seed somewhat flattened, with broadly concave face.

Type locality, "New Mexico;" collected by *Palmer* in 1869; type in Herb. Gray, duplicates in U. S. Nat. Herb. Associated with the type in the original description is "northern Arizona," collected by *Mrs. E. P. Thompson.*

From Colorado and Utah to New Mexico and Arizona.

Specimens examined:

COLORADO: Durango, *Alice Eastwood,* June 10, 1890; Mancos, *Alice Eastwood,* June, 1891; Ridgway, *Bethel* 23, June 25, 1898.

NEW MEXICO: Type specimens as cited under type locality; Fort Wingate, *Marsh,* May 27, 1883.

ARIZONA: *Palmer,* in 1869; northern Arizona, *Mrs. Thompson,* in 1872; Pagumpa, altitude 1,200 meters, *Jones* 5082, 5092, April 20–21, 1894.

UTAH: *Captain Bishop,* in 1872; southern Utah, *Palmer* 177, in 1877; Silver Reef, Cedar City, canyon above Tropic and Emery, altitude 1,350 to 2,100 meters, *Jones* 5163, 5204, 5312, 5445, May 4–June 16, 1894; Price, Carbon County, *Jones,* June 24, 1898.

9. **Aulospermum rosei** Jones, in litt.

The stout peduncles erect or declined, 5 to 10 cm. long, somewhat longer than the prostrate leaves; leaves leathery, smooth, ovate to ovate-oblong, pinnate with lobed or divided pinnæ, the ultimate segments ovate to obovate, abruptly triangular-toothed or lobed; umbel with unequal rays, no involucre, and involucels of several lanceolate acute purplish bracts barely united at base and 4 mm. long; rays 4 to 12 mm. long, the outer ones the longer and spreading at right angles; fruiting pedicels 3 mm. long; flowers purple; fruit broadly oblong, 8 to 10 mm. long, each carpel with 3 to 5 broad thin wings slightly thickened at insertion; oil tubes small, several in the intervals; seed face concave.

Type locality, on slopes and mesas in alkaline clay soil among the red hills at Richfield, Utah; collected by *Jones,* June 18, 1898; type in U. S. Nat. Herb.

Utah.

Specimens examined:

UTAH: Near mouth of Salina Canyon, altitude 1,560 meters, *Jones* 5422, June 14, 1894; type specimens as cited under type locality; red hills at Elsinore, *Jones,* June 13, 1898.

52. **CYMOPTERUS** Raf. Journ. Phys. **89**: 100. 1819.

Coloptera C. & R. Rev. N. Am. Umbell. 49. 1888.

Calyx teeth obsolete or evident. Fruit flattened dorsally, ovate, glabrous (puberulent at tip in *C. megacephalus*). Carpel with dorsal and intermediate ribs filiform or winged and approximate; lateral wings broad, very thick and corky, with neither nerves nor strengthening cells, coherent till maturity with those of the other carpel, forming a broad corky margin to the fruit usually thicker than the much-flattened fruit body, and in cross section showing a neck-like connection. Stylopodium wanting. Oil tubes very small, 4 to 8 in the intervals (solitary in *C. globosus*), 8 to 14 on the commissural side (2 in *C. globosus*). Seed very flat, with plane face.

Dwarf acaulescent xerophytic plants, with small pinnate or bipinnate leaves, no involucre (except occasionally in *C. fendleri* and *C. newberryi*), usually foliaceous and conspicuous involucels, and white or yellow flowers.

Type species, *Selinum acaule* Pursh, Fl. **2**:Suppl. 732. 1814.

A genus of 7 species belonging to the arid regions of western United States, a single species extending into Canada.

The type of the genus is *C. acaulis* (*Selinum acaule* Pursh), but eventually it was made to include an aggregate of species very different from this type. In our Revision the genus *Coloptera* was established to include forms that could not be associated with *Cymopterus* as generally understood. Later Mr. Marcus E. Jones called attention to the fact that certain species retained in *Cymopterus* had the essential characters of *Coloptera*, and a reexamination of old and new material has led us to the discovery that *Coloptera* represents the real genus *Cymopterus* as established by Rafinesque. Accordingly, the species of *Coloptera* and certain species of *Cymopterus* are herein set apart under the genus *Cymopterus* as established, and the other species of *Cymopterus*, those which have been commonly taken to represent the genus, are otherwise disposed of.

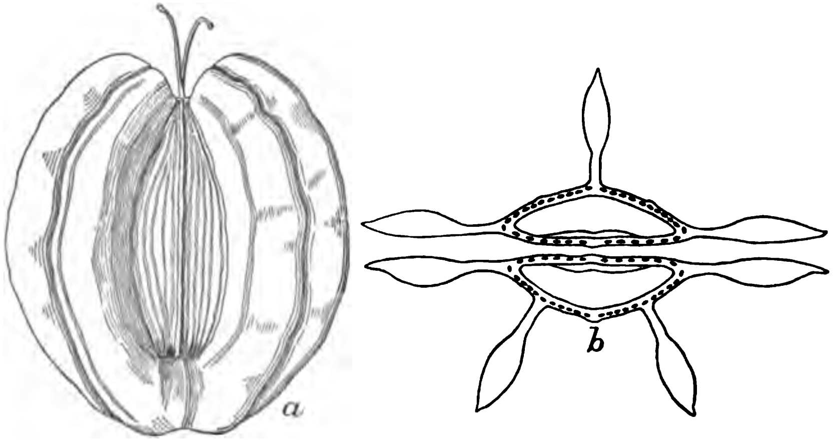


FIG. 53.—Cymopterus parryi: *a*, × 6; *b*, × 8.

The genus, as here set forth, appears to be a very natural one. The forms all appear acaulescent, so far as the aerial habit is concerned, the cluster of leaves and flowering stems forming a rosette which seems to be usually prostrate. Beneath the surface the rosette arises from a slender stem which is more or less elongated, dependent upon the depth of the elongated and thick root. The whole structure is strongly xerophytic, the plants growing in dry, sandy, or gravelly soil.

The species are also remarkably restricted in range, being confined to the arid regions of New Mexico, Arizona, Colorado, Utah, and Nevada, with the single exception of *C. acaulis*, the type of the genus, which has an extensive northern and eastern range.

The leaf habit is quite uniform, the blades being in various states of pinnate division between simply pinnate and almost thrice pinnate, so that such terms as "pinnae," "segments," "ultimate divisions," etc., are purely arbitrary and difficult of application.

There is great variation in the development of dorsal and intermediate wings. The laterals are always present, and have the characteristic thick and corky structure, but the dorsal and intermediate ribs may all be winged, or only some of them may be winged, or they may bear no wings at all, and these variations may occur even in the same plant.

The presence of an involucre is also often a matter of uncertainty. In the usual sense there is no involucre in the genus, but in some of the species a vestige in the form of a low sheath is apparent. Occasionally this sheath becomes toothed, and in *C. fendleri* and *C. newberryi* the teeth are sometimes produced into narrow bracts.

Two very natural sections of the genus are evident; the one with a compact head-like umbel and white flowers, the other with an open umbel and yellow flowers.

In the more technical characters *C. globosus* is the most exceptional species, with its solitary oil tubes and small involucellate bractlets, but in its combination of characters it can not be separated from the other species.

- Umbels globose; flowers white; involucre wanting.
  - Oil tubes several in the intervals.
    - Fruit glabrous.
      - Involucels of linear entire bratlets; fruit orbicular, not exceeding 8 mm. in diameter.
        - Leaf segments small and narrow; fruit 6 to 8 mm. in diameter. 1. *C. acaulis.*
        - Leaf segments shorter and more obtuse; fruit larger .... 2. *C. parryi.*
      - Involucels of broad more or less cleft bractlets; fruit broadly oblong, 10 mm. long .... 3. *C. leibergii.*
    - Fruit puberulent at apex .... 4. *C. megacephalus.*
  - Oil tubes solitary in the intervals .... 5. *C. globosus.*
- Umbels open; flowers yellow; a vestige of an involucre and sometimes bracts.
  - Leaf segments narrow .... 6. *C. fendleri.*
  - Leaf segments broad .... 7. *C. newberryi.*

1. **Cymopterus acaulis** (Pursh) Rydberg, Bot. Surv. Neb. **3**: 38. 1894.

Selinum acaule Pursh, Fl. **2**: 732. 1814.
Thapsia glomerata Nutt. Gen. **1**: 184. 1818.
Cymopterus glomeratus DC. Prodr. **4**: 204. 1830.
Cymopterus campestris Torr. & Gray, Fl. **1**: 624. 1840.

Low (7 to 20 cm.) and glabrous, with a short caudex bearing a cluster of leaves and peduncles; leaves merging from pinnate to bipinnate; ultimate segments mostly small and narrow; peduncles mostly shorter than the leaves; rays and pedicels very short, making a rather compact cluster; involucel of linear and entire more or less united foliose bractlets; flowers white; fruit 6 to 8 mm. in diameter, with 3 to 5 broad wings on each carpel; oil tubes small, 4 to 8 in the intervals (or double the number where a rib has been suppressed), 8 to 14 on the commissural side.

Type locality, "in upper Louisiana;" collected by *Bradbury;* type specimen said by Pursh to be in Herb. Bradbury.

Dry plains from Arkansas to Colorado on the south, and extending northward into the great plains of Canada.

Specimens examined:

ARKANSAS: Fort Lyon, *Palmer*, April 9, 1863.

COLORADO: Plains, *Hall & Harbour* 211, in 1862; near Denver, *Wolf*, June, 1873; Pueblo, *Hicks* 157, June, 1890; Denver, *Alice Eastwood*, in 1891; dry plains, *Crandall*, April 28, 1894; Larimer County, *Baker* 3934, May 1, 1895; Fort Collins, *Cowen* 184, April 29, 1891; New Windsor, *Osterhout*, May, 1895; near Denver, *Holzinger* 6, 7, 8, 11, May 25–June 10, 1896.

WYOMING: Cheyenne, *Havard*, in 1893; Laramie, *A. & E. Nelson* 6829, May 31, 1899.

SOUTH DAKOTA: Black Hills, *Rydberg* 727, May 27, 1892; Smithville, *V. Bailey* 12, June 1, 1894.

MONTANA: Bluffs of the Missouri, *Havard*, May, 1879; Great Falls, *Williams*, June, 1887 and 1891.

ASSINIBOIA: Medicine Hat, *Macoun* 4966, May 31, 1894.

2. **Cymopterus parryi** (C. & R.) Jones, Zoe **4**: 48. 1893. FIG. 53.

Coloptera parryi C. & R. Rev. N. Am. Umbell. 50. 1888.

Resembling *C. acaulis*, but the leaf segments shorter and more obtuse, the fruit somewhat larger with thicker lateral wings, the bractlets somewhat different, and said to come from the mountains instead of the plains.

Type locality, "Little Sandy, northwest Wyoming;" collected by *Parry* in 1873; type in Herb. Gray.

Western Wyoming and Montana.

Specimens examined:

WYOMING: Type specimens as cited under type locality; Granger, *Jones*, June 24, 1896; same station, *Aven Nelson* 4626, June 10, 1898.

MONTANA: Gallatin County, *Tweedy*, May, 1888.

3. **Cymopterus leibergii** C. & R., sp. nov.

Resembling *C. acaulis*, but somewhat stouter; leaves tripinnate, the ultimate segments short and mostly obtuse; peduncles as long as the leaves or longer; involucels of broad somewhat membranaceous bractlets more or less 3-cleft at the apex; fruit broadly oblong, 10 mm. long.

Type locality, Malheur Valley, near Harper Ranch, Oregon; collected by *Leiberg*, no. 2253, June 12, 1896; type in U. S. Nat. Herb.

Oregon and Idaho.

Specimens examined:

OREGON: Type specimens as cited under type locality.

IDAHO: Blue Lakes, *Palmer* 67, June 3, 1893.

4. **Cymopterus megacephalus** Jones, Zoe **2**: 14. 1891.

Low (5 to 15 cm.) and glabrous, a cluster of prostrate leaves and peduncles arising from a thick root; leaves shorter than the fruiting peduncles, pinnate or bipinnate, with narrowly oblong pinnatifid segments; ultimate divisions rather narrow and bluntly toothed; rays and pedicels obsolete, the white flowers and fruit being in dense globose heads, and the bractlets of the involucel wedge shaped, more or less united at base and toothed at apex; fruit 6 to 8 mm. long, obovate, puberulent at tip, the 3 to 5 thick carpel wings usually unequal, becoming narrower toward the base of the fruit; oil tubes several in the intervals, 8 or more on the commissural side.

Type locality, "Little Colorado, northern Arizona, growing in gravel;" collected by *Jones;* type specimen in Herb. Jones, duplicate in U. S. Nat. Herb.

Northern Arizona and probably in Nevada.

Specimens examined:

ARIZONA: Little Colorado, *Jones*, June 10, 1890.

NEVADA: *Shockley*, April, 1886, seems to be this species, but is not in fruit.

Apt to be confused with *C. globosus*, which it very much resembles in general habit, but is distinct in its more finely dissected leaves with narrower segments and blunter teeth, larger and toothed involucellate bractlets, puberulent fruit, and numerous oil tubes.

5. **Cymopterus globosus** Watson, Proc. Am. Acad. **11**: 141. 1876.

Cymopterus montanus globosus Watson, Bot. King Surv. 124. 1871.

Low (5 to 10 cm.) and glabrous, the cluster of few leaves and peduncles springing from a slender subterranean stem; leaves glaucous, pinnate or bipinnate, with broadly oblong pinnatifid segments; ultimate divisions rather broad, more or less cuspidate-toothed; rays and pedicels obsolete, the white flowers and fruit being in dense globose heads, and the bractlets of the involucel small and linear, hidden among the flowers of the dense cluster; fruit 6 to 8 mm. long, obovate, the 5 thick carpel wings approximately equal, becoming narrower toward the base of the fruit; oil tubes solitary in the intervals, 2 on the commissural side and a small one in each wing.

Type locality, "Carson Valley and on the Virginia and Trinity Mountains, Nevada, altitude 4,500 to 7,000 feet;" collected by *Watson*, no. 449; type specimens in U. S. Nat. Herb.

Valleys in the mountains of northern Nevada.

Specimens examined:

NEVADA: Near Carson City, altitude 1,500 meters, *Watson* 449 except fruit, April, 1868; near Empire City, *Jones* 3885, May 20, 1882.

A very rare species, having been collected but two or three times.

6. **Cymopterus fendleri** Gray, Pl. Fendl. 56. 1849.

Cymopterus decipiens Jones, Zoe **2**: 246. 1891.

Low (5 to 10 cm.) and glabrous, the cluster of leaves and peduncles springing from a slender subterranean stem which arises from an elongated thick root; leaves usually exceeding the peduncles, 2 to 3-pinnate; pinnae and segments 5 or 7, oblong and incised; umbels with few and unequal rays and yellow flowers, sterile flowers with longer pedicels than the fertile; involucre represented by a short sheath whose teeth are occasionally prolonged into small linear bracts, and involucels of bractlets united at base and exceeding the flowers; fruit oblong, 6 to 10 mm. long; each carpel with 3 or 4 wings which are thin at the margin and also next to the body; oil tubes several in the intervals, 4 to 8 on the commissural side.

Type locality, "Gravelly hills, Santa Fe," N. Mex.; collected by *Fendler*, no. 274; type specimen in U. S. Nat. Herb.

Gravelly soil, New Mexico, Colorado, and Utah.

Specimens examined:

New Mexico: Hills near Santa Fe, *Fendler* 274, in 1847; same station, *A. A. & E. Gertrude Heller* 3539, May 15, 1897.

Colorado: Westwater, *Jones*, May, 1890; Mancos, *Alice Eastwood*, May and June, 1890 and 1891; Grand Junction, *Crandall*, May 28, 1894; same station, *Jones*, May 22, 1895.

Utah: Cisco, *Jones*, May 2, 1890, type of *C. decipiens* Jones (in Herb. Jones, duplicate in U. S. Nat. Herb.); Green River, *Jones*, May 22, 1895.

This species differs from the preceding species of *Cymopterus* in the presence of what may be regarded as a vestige of an involucre, in the form of a distinct but short sheath, whose teeth are occasionally prolonged into small narrow bracts.

7. **Cymopterus newberryi** (Watson) Jones, Zoe **4**: 47. 1893.

Peucedanum newberryi Watson, Am. Nat. **7**: 301. 1873.
Ferula newberryi Watson, Proc. Am. Acad. **11**: 145. 1876.
Coloptera newberryi C. & R. Rev. N. Am. Umbell. 49. 1888.
Coloptera jonesii C. & R. Rev. N. Am. Umbell. 50. 1888.
Cymopterus newberryi alatus Jones, Zoe **4**: 47. 1893.
Cymopterus newberryi jonesii Jones, Proc. Cal. Acad. II. **5**: 684. 1895.

Often more robust than the other species (5 to 18 cm. high), but with the same habit; leaves shorter than the peduncles, pinnately 3 to 5-foliolate or simply lobed, lobes and leaflets broad; terminal leaflet 3-lobed, the lower mostly 2-lobed, all the lobes sparingly incised; umbel unequally 4 to 13-rayed, with yellow flowers, and conspicuous involucels of more or less unequal oblong to ovate foliaceous bractlets; fruit sessile or nearly so, 6 to 8 mm. long, with very thick lateral wings and dorsal and intermediate ribs filiform or winged; oil tubes 4 to 8 in the intervals, 8 to 10 on the commissural side.

Type locality (*Peucedanum newberryi* Watson), "New Mexico; northern Arizona;" collected by *Newberry* and *Mrs. E. P. Thompson;* type in Herb. Gray.

New Mexico, northern Arizona, Utah, and Colorado.

Specimens examined:

Utah: Southern Utah, *Palmer* 180, in 1877; Milford, *Jones* 1792 (type of *Coloptera jonesii* C. & R.), June 18, 1880; Laverken (5196L) and Silver Reef (5163u), *Jones*, May, 1894; Moab, *Alice Eastwood* 3, May, 1892.

Colorado: Westwater, *Jones*, May, 1890.

Since our description of *Coloptera jonesii* (Rev. N. Am. Umbell.) further material makes it evident that the appearance of wings on the dorsal and intermediate ribs is very inconstant. In fact, these ribs are sometimes either with or without wings on the same plant. In view of this fact the principal character for *C. jonesii* breaks down, and it is merged with *Cymopterus newberryi*, as above.

8. **Cymopterus lapidosus** Jones, Contrib. Western Botany no. 8:31. 1898. **Fig. 54.**

Peucedanum lapidosum Jones, *Zoe* **2**: 246. 1891.

Glabrous; leaves and peduncles borne in a cluster at the summit of a more or less elongated subterranean stem arising from a long branching root; leaves 5 to 10 cm. long, pinnate to bipinnate, the pinnae rather crowded, ovate, lower ones incised, upper ones entire; peduncles sometimes shorter than the leaves, or becoming 1.5 to 2 cm. high, bearing a nearly equally rayed umbel, with involucels of several linear bractlets; rays 1 to 2 cm. long; pedicels 4 mm. long; flowers white; fruit oblong, glabrous, 6 to 7 mm. long, 2 to 2.5 mm. broad, with wings half as broad as body or less, and prominent dorsal and intermediate ribs (more or less winged); oil tubes several in the intervals.

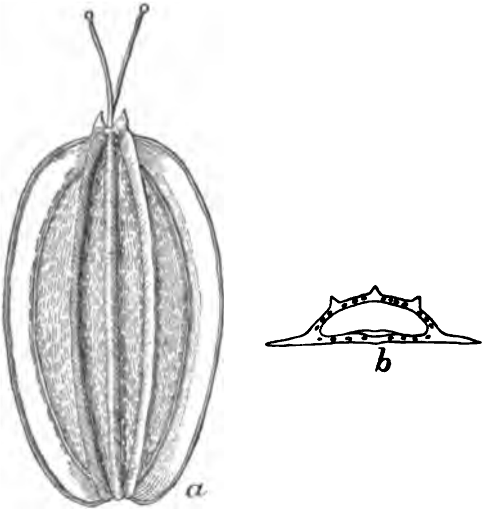


Fig. 54.—Cymopterus lapidosus: *a*, *b*, × 8.

Type locality not given, but label states "Echo City, Summit County, Utah;" collected by *Jones*, May 7, 1890; type in Herb. Jones, duplicate in U. S. Nat. Herb.

Northwestern Utah and adjacent Wyoming.

Specimens examined:

Utah: Type specimens as cited under type locality.

Wyoming: Granger, Sweetwater County, *Jones*, June 24, 1896.

Mr. Jones describes this species as "a delicate, heavy-scented plant, growing under rocks like ferns, spreading flat on the ground, or erect in more exposed situations."

The relationship of this species is very doubtful, and until it has been more carefully studied it must remain under *Cymopterus*, although it is not congeneric with the above species. It may represent a new generic type.

Cymopterus nivalis Watson is a poorly known species. For a statement concerning it, see under *Pseudocymopterus*.

53. RHYSOPTERUS C. & R., gen. nov.

Calyx teeth evident. Fruit flattened laterally, nearly orbicular in outline, glabrous. Carpel flattened dorsally, boat shaped (margins and ends incurved), with 5 equal prominent corky obtuse ribs, which are wing like and very much wrinkled when young. Carpophore wanting (at least not showing in ripe fruit). Stylopodium wanting. Oil tubes small, solitary in the intervals, 2 on the commissural side. Seed boat-shaped, with a broad and deep sulcus.

Low dry ground glabrous plants, with leaves and peduncles in a cluster at the summit of a short slender stem (more or less subterranean) arising from a very thick elongated root, once or twice pinnate thick or coriaceous leaves with broad segments, no involucre, involucels of rather conspicuous bractlets, and white flowers. Name from ῥυσὸς, *wrinkled*, and πτερὸν, *wing*.

Type species, *Rhysopterus plurijugus* C. & R.

A genus of 3 species, belonging to the arid regions of Utah, Nevada, and eastern Oregon.

The genus resembles *Cymopterus*, and especially *C. newberryi* in habit, but has a very different fruit, which most closely resembles that of *Oreoxis*, but the latter has sharper ribs, flat-faced carpels, and very different foliage and habitat.

Primary leaf divisions 3, terminal largest, laterals deeply 2-lobed.
  Umbels several, forming a compact cluster .... 1. *R. plurijugus.*
  Umbels usually solitary .... 2. *R. jonesii.*
Primary leaf divisions 5, basal pair largest and pinnately 3 to 5-cleft .. 3. *R. corrugatus.*

1. **Rhysopterus plurijugus** C. & R., sp. nov. FIG. 55.

Leaves coriaceous, 2 to 3 cm. long, on very short petioles, with broadly oblong or ovate and obtuse outline; leaflets 3, the laterals deeply 2-lobed, the terminal one much larger and usually 3-lobed, all the lobes somewhat cleft and coarsely crenate-mucronate-toothed; peduncles shorter than the leaves; umbels several, forming a compact cluster, with involucels of ovate acuminate bractlets distinct nearly to the base; rays very stout, 8 to 10 mm. long; fruiting pedicels 1 to 3 mm. long, shorter than those of the sterile flowers; fruit 3 mm. long, an accessory pair of corky ribs on the commissural side of the laterals, giving the appearance of a 7-ribbed carpel.

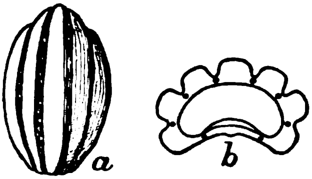


FIG. 55.—Rhysopterus plurijugus: *a*, × 6; *b*, × 8.

Type locality, Malheur Valley, near Harper ranch, Oregon, altitude 1,000 meters; collected by *Leiberg*, no. 2240, June 10, 1896; type in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:
OREGON: Type specimen as cited under type locality.

2. **Rhysopterus jonesii** C. & R., sp. nov.

Resembling *R. plurijugus*, but leaves somewhat fleshy, with longer petioles, and the teeth not mucronate; umbels solitary and on longer peduncles.

Type locality, Juab, Utah, altitude 1,200 meters; collected by *Jones*, no. 1691, April 30, 1880; type in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:
UTAH: Type specimen as cited under type locality.

3. **Rhysopterus corrugatus** (Jones) C. & R.

Cymopterus corrugatus Jones, Am. Nat. **17**: 973. 1883.

Leaves becoming 7 cm. long, with a more oblong outline, and more dissected; primary divisions or leaflets 5, basal pair the largest, ovate, pinnately 3 to 5-cleft, the ultimate divisions cleft and sharply toothed; umbels usually solitary and on longer peduncles, with involucels of ovate bractlets often cleft at apex into 3 long linear lobes.

Type locality, "Rose Creek," near Humboldt Lake, Nevada; collected by *Jones*, no. 3886, June 17, 1882; type in Herb. Jones, duplicate in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:

NEVADA: Type specimens as cited under type locality.

54. PSEUDOCYMOPTERUS C. & R. Rev. N. Am. Umbell. 20 and 74. 1888.

Calyx teeth evident. Fruit oblong, glabrous. Carpel with very prominent and acute (sometimes narrowly winged) dorsal and intermediate ribs, and rather broad and thickish lateral wings (sometimes not much more prominent than the dorsals and intermediates), which are distinct from those of the other carpel. Stylopodium wanting. Oil tubes 1 to 4 in the intervals, 2 to 8 on the commissural side. Seed more or less flattened, with plane face (except in *P. bipinnatus*).

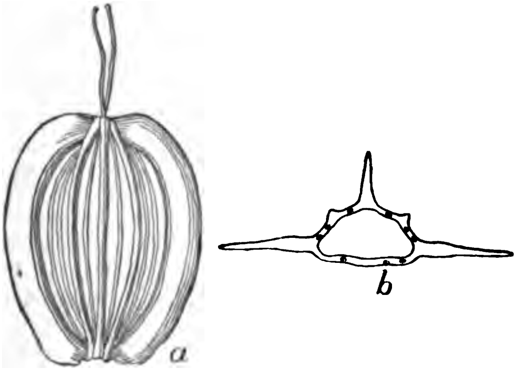


FIG. 56.—Pseudocymopterus montanus: *a*, × 6; *b*, × 8.

Caulescent or acaulescent plants, with bipinnate leaves, no involucre (very rarely a bract or two), involucels of mostly linear bractlets, and variously colored flowers.

Type species, *Thaspium(?) montanum* Gray, Pl. Fendl. 57. 1849.

A group of 4 species, belonging chiefly to the Rocky Mountains and extending from New Mexico and Arizona to Montana and eastern Oregon.

Caulescent and slender; flowers yellow or purple .... 1. *P. montanus.*
Acaulescent and cespitose; flowers white or yellow.
  Leaves on long petioles and with pungently acute segments .... 2. *P. anisatus.*
  Leaves on short petioles, very pale or glaucous, not so pungent.
    Peduncles 3 to 5 cm. long .... 3. *P. hendersoni.*
    Peduncles 10 to 20 cm. long .... 4. *P. bipinnatus.*

1. **Pseudocymopterus montanus** (Gray) C. & R. Rev. N. Am. Umbell. 74. 1888. FIG. 56.

Thaspium(?) montanum Gray, Pl. Fendl. 57. 1849.
Ligusticum montanum Benth. & Hook. in Watson Bibliog. Index, 426. 1878.

Stem erect, slender, 3 to 6 dm. high, more or less leafy, glabrous except at the base of the umbel or on the rays; the bipinnate leaves mostly with broad outline; leaflets exceedingly variable, variously cut or entire; umbel 6 to 12-rayed, with involucels of linear or setaceous bractlets longer than the yellow flowers; rays 12 to 30 mm. long; pedicels about 2 mm. long; fruit broadly oblong, 4 to 5 mm. long, with lateral wings almost as broad as body, the dorsal and intermediates very variable (either ribbed or narrowly winged); oil tubes 1 to 4 in the intervals, 4 to 6 on the commissural side; seed much flattened.

Type locality, "Sunny declivities, at the foot of mountains, along Santa Fe Creek," New Mexico; collected by *Fendler*, no. 276; type in U. S. Nat. Herb.

From New Mexico and Arizona to Utah, Colorado, and western Wyoming.

Specimens examined:

NEW MEXICO: Type specimens as cited under type locality; Santa Fe Canyon, near Santa Fe (type locality), altitude 2,400 meters, *A. A. & E. Gertrude Heller* 3651, June 2, 1897; White Mountains, Lincoln County, altitude 2,250 meters, *Wooton* 350, August 15, 1897.

ARIZONA: Flagstaff, *Jones* 4016, August 7, 1884; same station, *Tracy* 236, June 24, 1887; about Mormon Lake, altitude 1,800 meters, *MacDougal* 106, June 12, 1898.

UTAH: *Ward* 330, 494, in 1875; Marysvale and Panguitch Lake, altitude 2,520 to 2,670 meters, *Jones* 5367, 6015, June and September, 1894.

COLORADO: Halfmoon Creek, Union Creek Pass (altitude 3,600 meters), Lake Creek, and Clear Creek, *Wolf* 716, 719, 720, 724, June–August, 1873; North Park, *Sheldon* 124, July 28, 1884; Durango, *Alice Eastwood*, June 7, 1890; Cameron Pass, altitude 3,600 meters, *Crandall*, September 1, 1890; Williams Canyon, altitude 2,100 meters, *Crandall*, May 27, 1892; Middle Park, *Beardslee* 125, August, 1892; Rabbit Ear Range, altitude 2,940 meters, *Crandall*, July 20, 1894; Telluride, altitude 3,240 meters, *Tweedy* 204, August 25, 1894; Leadville, *Osterhout*, June, 1895; Gore Mountains, altitude 2,850 meters, *Bethel*, August, 1895; Leadville and Breckenridge, altitude 3,000 to 3,150 meters, *Holzinger* 1, 2, May–June, 1896; Cameron Pass, altitude 3,000 meters, *Baker* 5, July 13, 1896; Pikes Peak, altitude 2,520 meters, *Knowlton* 3, June 14, 1896; hills above Mancos (altitude 2,400 to 2,700 meters), and Cumberland Basin, La Plata Mountains (altitude 3,690 meters), *Baker, Earle & Tracy* 137, 619, June–July, 1898.

WYOMING: Saw Mill Creek and Laramie Hills, *Nelson* 1238, May, 1894 and 1895; Madison River, Yellowstone Park, *A. & E. Nelson* 5496, June 23, 1899.

Extremely variable, but the two following forms seem to be worthy of varietal rank:

Pseudocymopterus montanus tenuifolius (Gray) C. & R., l. c. 75.

Thaspium (?) montanum tenuifolium Gray, Pl. Wright 2: 65. 1853.
Ligusticum montanum tenuifolium Watson, Bibl. Index 426. 1878.

Often larger and more branching, with narrowly linear leaflets 1 to 4 cm. long.

Type locality, "Hillsides of Coppermine Creek, New Mexico;" collected by *Wright*, no. 1107, in 1851; type in Herb. Gray, duplicate in U. S. Nat. Herb.

From Colorado to New Mexico and Arizona.

Specimens examined:

COLORADO: La Veta Pass, *Vasey*, in 1884; Grays Peak, *Patterson* 42, July–August, 1885; Table Rock, altitude 2,250 meters, *Breninger*, June 6, 1891; foothills, altitude 1,650 to 1,950 meters, *Crandall*, May 12–27, 1893; Leadville, altitude 3,300 meters, *Bethel*, July 1, 1894; near Como, altitude 3,000 meters, *Crandall*, August 1, 1895; Pikes Peak, altitude 2,100 to 3,000 meters, *Holzinger* 10, 1896.

NEW MEXICO: Type specimens as cited under type locality; Mogollon Mountains, *Rusby* 148½, August, 1881; Pinos Altos, *Nealley* 46, June, 1891; Big Hatchet Mountains, *Mearns* 39, May 17, 1892.

ARIZONA: *Palmer*, in 1869; Willow Spring, *Rothrock* 253, July, 1874; San Francisco Mountain, *Knowlton* 120, August 26, 1889; Willow Spring, *Palmer* 500, June 10–20, 1890; Fort Huachuca, *Wilcox* 481, September, 1894; Flagstaff, altitude 2,100 meters, *MacDougal* 256, July 8, 1898.

Pseudocymopterus montanus purpureus C. & R., l. c.

Short caulescent, with rather weak ascending peduncles (7.5 to 15 cm. long), and purple flowers.

Type locality, "Fort Humphreys, Arizona;" collected by *Rusby*, no. 632, July, 1883; type in U. S. Nat. Herb.

Utah, Arizona, and New Mexico, and extending into Mexico.

Specimens examined:

UTAH: Mount Ellen, Henry Mountains (altitude 3,300 meters), Bromide Pass (altitude 3,000 meters), Fish Lake (altitude 3,000 meters), and Marysvale (altitude 3,450 meters), *Jones* 5679, 5695, 5717, 5770, 5893, July 25–August 23, 1894.

ARIZONA: *Palmer*, July 4, 1869; Flagstaff and Mount Humphreys, *Rusby* 631, 632, July–August, 1883; Flagstaff, *Lemmon*, September, 1884; same station, *Jones*, August 13, 1884; San Francisco Mountain, *Knowlton* 74, 81, August 23, 1889; Cheno Valley, *Toumey* 192, June 24, 1892; Buckskin Mountains, altitude 2,700 meters, *Jones* 6056, September 19, 1894; Walnut Canyon and Humphreys Peak, altitude 2,100 to 3,600 meters, *MacDougal* 332, 395, July–August, 1898.

NEW MEXICO: Bear Mountains, *Rusby* 147½, May, 1881.

2. **Pseudocymopterus anisatus** (Gray) C. & R., l. c. 1888.

Cymopterus (?) *anisatus* Gray, Proc. Philad. Acad. 1862: 63. 1863.

Acaulescent, cespitose from a much branched caudex, which is more or less covered with the remains of old leaves; leaves on long petioles, narrow, somewhat rigid, pinnate, and the leaflets pinnately parted into linear (sometimes broader) pungently acute segments; peduncles 1 to 3 dm. high, exceeding the leaves; umbel unequally 5 to 12-rayed, with involucels of linear-subulate (sometimes lobed) bractlets exceeding the white or yellow flowers; rays 1 to 7.5 cm. long; pedicels 2 to 6 mm. long; fruit about 4 mm. long, the carpel irregularly 2 to 5-winged; oil tubes 1 to 3 in the intervals, 2 to 4 on the commissural side; seed face plane.

Type locality, "Dry hills in the middle mountains," Colorado; collected by *Hall & Harbour*, no. 222, in 1862; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Mountains of Colorado, Utah, and Nevada, northward to northwestern Wyoming and Oregon.

Specimens examined:

COLORADO: Type specimens as cited under type locality; *Scoville*, in 1869; El Paso County, *Letterman* 220, August 3, 1884; Grays Peak, *Patterson* 40, July–August, 1885; North Cheyenne Canyon, El Paso County, altitude 2,550 meters, August 6, 1892; Red Cliff, altitude 2,400 meters, *Bethel*, July 2, 1894.

WYOMING: Fort Steele, *Nelson* 4803, June 18, 1898; Teton Mountains, *A. & E. Nelson* 6507, August 16, 1899.

UTAH: Alta, Wasatch Mountains, altitude 3,750 meters, *Jones* 5677, July 25, 1894.

NEVADA: East Humboldt Mountains, altitude 2,400 meters, *Watson* 453, August, 1868.

3. **Pseudocymopterus hendersoni** C. & R., sp. nov.

Acaulescent, cespitose, the caudex clothed with old leaf sheaths and petioles; leaves on short petioles, very pale, narrow in outline, pinnate; the pinnae somewhat ovate in outline, but deeply cleft into 3 to 5 linear entire segments; peduncles longer than leaves, 3 to 5 cm. long; umbels small, compact; rays 4 to 6, 3 to 5 mm. long; pedicels short; involucel of linear entire bractlets; fruit immature.

Type locality, mountain peak near source of Mill Creek, Idaho, altitude 3,740 meters; collected by *Henderson*, no. 4068, August 21, 1895; type in U. S. Nat. Herb.

Mountains of Idaho.

Specimens examined:

IDAHO: Type specimens as cited under type locality.

This species is nearest *P. anisatus*, but has very different foliage.

4. **Pseudocymopterus bipinnatus** (Watson) C. & R. Rev. N. Am. Umbell. 75. 1888.

Cymopterus bipinnatus Watson, Proc. Am. Acad. **20**: 368. 1885.

Cespitose, the short branches of the rootstock covered with the crowded remains of dead leaves, glaucous, puberulent; leaves pinnate with few pairs of short segments, which are pinnately divided into short linear lobes; peduncles 1 to 2 dm. high, much exceeding the leaves; rays 2 to 8 mm. long; involucels of conspicuous linear-lanceolate or broader bractlets, with hyaline margins, and more or less united at base; flowers white; fruit nearly sessile, ovoid, 3 to 4 mm. long, moderately flattened dorsally, the 5 thickish carpel wings equal and narrow (often being but very prominent acute ribs); oil tubes 3 or 4 in the intervals, 6 to 8 on the commissural side; seed face slightly concave.

Type locality, "in the Rocky Mountains, south of Virginia City, Montana;" collected by *Hayden*, in 1871 (distributed as *Cymopterus foeniculaceus*); type in Herb. Gray. Also associated with type in original description; "on a ridge above Bannock City, southwest Montana," *Watson*, in 1880; "on Mount Helena, Montana," *Canby*, in 1883.

In the mountains of western Wyoming, Montana, Idaho, and Oregon.

Specimens examined:

Wyoming: Monida, *A. & E. Nelson* 5411, June 16, 1899.

Montana: Ridges above Bannock, altitude 2,100 meters, *Watson* 158, July 19, 1880; Mount Helena, *Canby* 148, July 6, 1883; same station, *Williams* 516, April 30, 1886; same station, *Kelsey* 133, May–June, 1887 and 1888; *Tweedy*, June, 1888; Pole Creek and Cedar Mountain, *Rydberg* 4628, 4629, 4630, July 4–16, 1897.

Idaho: Mountain top near Challis, altitude 2,400 meters, *Henderson* 3810, August 3, 1895.

Oregon: Steins Mountains, *Cusick* 2040*a*, July 15, 1898.

Kelsey 133 of 1887 and *Tweedy* of 1888 differ from the ordinary forms of the species in having glabrous leaves, with narrow and longer leaf segments.

Cymopterus nivalis Watson, Bot. King Surv. 123. 1871, collected by *Watson* (no. 448), has not been collected since, and on account of absence of fruit and general insufficiency of material can not be definitely placed. The testimony at hand, however, suggests that it may be congeneric with *Pseudocymopterus bipinnatus*. The type locality is given as "East Humboldt Mountains, [N.] Nevada, 9,000 to 10,000 feet altitude," the material being collected July, 1868.

55. POLYTAENIA DC. Coll. Mém. 5: 53. 1829.

Calyx teeth conspicuous. Fruit obovate to oval, much flattened dorsally, glabrous. Carpel with dorsal and intermediate ribs small or obscure in the depressed often corky back; laterals forming broad and usually thick corky wings closely contiguous to those of the other carpel and forming the margin of the fruit. Stylopodium wanting. Oil tubes 12 to 18 about the seed (4 to 6 on the commissural side) and many scattered through the thick corky pericarp, which also contains 5 small bundles of strengthening cells. Seed section oval or much flattened.

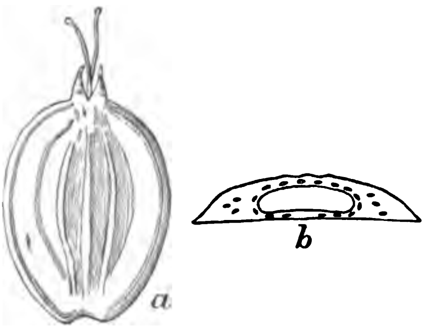


Fig. 57.—Polytaenia nuttallii: *a*, *b*, × 4.

Perennial mostly glabrous herbs, with twice pinnate leaves, no involucre, involucels of narrow bractlets, and bright yellow flowers.

A monotypic genus of the Mississippi Basin.

1. **Polytaenia nuttallii** DC. Coll. Mém. **5**: 54. pl. 13. 1829. FIG. 57.

Plants 6 to 9 dm. high, mostly glabrous except the pubescent pedicels and involucels; leaf segments cuneate and incised; upper leaves opposite and 3-cleft; umbel 6 to 12-rayed; rays about 2.5 cm. long; pedicels 2 to 4 mm. long; fruit 6 to 10 mm. long; dorsal and intermediate ribs obsolete and oil tubes superficially indistinct; lateral wings very thick, leaving the body more or less depressed.

Type locality, "territoire de l'Arkansa;" collected by *Nuttall* in 1825; type in Herb. DC., duplicate in Herb. Philad. Acad.

Dry soil, from southern Michigan and Wisconsin to Alabama and Texas.

Specimens examined:

WISCONSIN: Oshkosh, *Kellerman*.

ILLINOIS: Athens, *Hall*, June, 1868; Marion County, *French*, June 7, 1873.

TENNESSEE: Near Nashville, *Gattinger*.

MISSOURI: Allenton, *Letterman*, August, 1880; Desoto, *Hasse*, June, 1887; Shannon County, *Bush*, June 2, 1890; Eagle Rock, *Bush*, 159, June 22, 1897.

INDIAN TERRITORY: Muscogee, *Carleton*, April 25, 1891 (in flower).

OKLAHOMA: Paradise, *Waugh*, June 22, 1893.

TEXAS: Near Hockley, *Thurow*, September, 1890; College Station, *Dewey*, June 10, 1891.

Several other Texan sheets were examined, but as the plants are only in flower it is impossible to determine whether they are the species or its variety. The specimens are as follows: Fort Chadbourne (*Swift* in 1856); Houston (*Hall* 257 in 1872); Gillespie County (*Jermy* 138); Houston (*Rose* in 1899).

Polytaenia nuttallii texana C. & R., var. nov.

Fruit more commonly obovate, with much thinner wings (the body not at all depressed), filiform dorsal and intermediate ribs, and distinct and broader oil tubes.

Type locality, near Industry, Tex.; collected by *Wurzlow* in 1895; type in U. S. Nat. Herb.

Southern Texas.

Specimens examined:

TEXAS: San Antonio, *Havard*, in 1882; Kerrville, Kerr County, *Heller* 1669, June 25, 1894; type specimens as cited under type locality.

56. OXYPOLIS Raf. Neogen. 2. 1825.

Tiedemannia DC. Coll. Mém. **5**: 51. 1829.
Archemora DC. Coll. Mém. **5**: 52. 1829.

Calyx teeth evident. Fruit flattened laterally, ovate to obovate, glabrous. Carpel with dorsal and intermediate ribs filiform; lateral wings closely contiguous to those of the other carpel and nerved dorsally at the inner margin (giving the appearance of 5 filiform ribs on the back of each carpel); strengthening cells beneath the dorsal ribs and nerves of the lateral wings. Stylopodium thick, short conical. Oil tubes solitary in the intervals, 2 to 6 on the commissural side. Seed face plane.

Smooth erect swamp herbs, with fascicled tubers, leaves simply pinnate or ternate or reduced to petioles, involucre of few bracts or none, involucels of numerous small bractlets or none, and white flowers.

First species cited by Rafinesque, *Sium rigidius* L. Sp. Pl. **1**: 251. 1753.

A genus of 5 species, belonging to North America.

Leaves reduced to cylindrical jointed petioles........................ 1. *O. filiformis.*
Leaves either ternate or pinnate.
  Leaves ternate; leaflets entire.. 2. *O. ternata.*
  Leaves pinnate; leaflets mostly toothed.
    Leaflets entire or sharply-toothed; lateral wings broad; eastern.. 3. *O. rigidior.*
    Leaflets from serrate to crenate-toothed; lateral wings narrow; western.
      Leaflets 5 to 9; rays unequal; Rocky Mountains............... 4. *O. fendleri.*
      Leaflets 9 to 13; rays equal or nearly so; Oregon............ 5. *O. occidentalis.*

1. **Oxypolis filiformis** (Walt.) Britton, Mem. Torr. Club **5** : 239. 1894.

Oenanthe filiformis Walt. Fl. Car. 113. 1788.
Oenanthe teretifolia Muhl. Cat. 31. 1813.
Tiedemannia teretifolia DC. Coll. Mém. **5** : 81. pl. 12. 1829.
Peucedanum teretifolium Wood, Bot. & Flor. 136. 1870.

Stem 6 to 18 dm. high, fistulous; leaves reduced to cylindrical hollow pointed petioles (jointed by transverse partitions); umbel 6 to 12-rayed, with involucre and involucels of few or many subulate bracts; rays 1 to 4 cm. long; pedicels 4 to 6 mm. long; fruit somewhat obovate, 4 to 5 mm. long, truncate or rounded at base and rounded at apex, and with wings thinner than the body; disk prominent, with a short conical stylopodium; oil tubes large, filling the intervals, 2 to 4 on the commissural side.

Type locality not given, but presumably in the Carolinas.

Ponds and swamps, from southern Virginia to Florida and west to Louisiana.

Specimens examined:

FLORIDA: Apalachicola, *Chapman;* Biscayne Bay, *Palmer*, in 1874; Jacksonville, *Curtiss*, in 1875, 1893, and 1894; southern Florida, *Garber*, April, 1877; *Simpson*, in 1889; Baldwin, Duval County, *Nash* 2596, September 6, 1895.

MISSISSIPPI: Ocean Springs, Jackson County, *Skehan,* June 24, 1895; same station, *Pollard* 1015, July 25, 1896.

Oxypolis filiformis canbyi C. & R., var. nov.

Fruit orbicular or short oblong, retuse at base and apex, with thick corky lateral wings (leaving the body depressed), an inconspicuous disk with a slender conical stylopodium, and smaller oil tubes not filling the intervals.

Type locality, moist upland meadows, Ellendale, Del.; collected by *Canby*, August, 1867; type in U. S. Nat. Herb.

Only known from the type locality, our specimens being from collections made by *Canby* in 1867, 1874, and 1891; and by *Commons* in 1877.

As this form contradicts one of the chief characters of *Oxypolis*, it may represent a different generic type, but its very close resemblance to *O. filiformis* in other regards, and its extremely local occurrence constrain us to regard it rather as a well-established local variety.

2. **Oxypolis ternata** (Nutt.) Heller, Cat. N. Am. Pl. 5. 1898.

Peucedanum ternatum Nutt. Gen. **1**: 182. 1818.
Archemora ternata Nutt. in Torr. & Gray, Fl. **1**: 631. 1840.
Neurophyllum longifolium Torr. & Gray, Fl. **1**: 613. 1840.
Tiedemannia ternata C. & R. Bot. Gaz. **12**: 74. 1887.

Stem slender, 6 to 9 dm. high; leaves few, with very long petioles, ternately divided into more or less elongated entire linear or filiform leaflets, or sometimes reduced to two leaflets or even one; umbel 6 to 9-rayed, with involucre of few small bracts, and involucels of several setaceous bractlets; rays 2.5 to 4 cm. long; pedicels 6 to 10 mm. long; fruit ovate to obovate, 4 mm. long; oil tubes smaller than in *O. filiformis*, 4 on the commissural side.

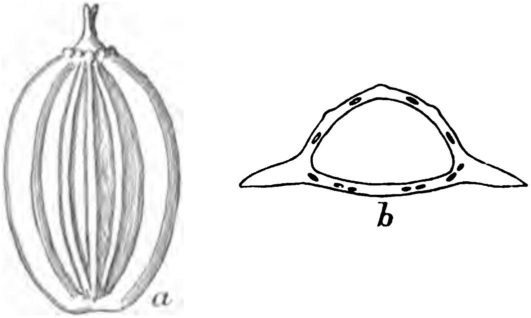


FIG. 58.—Oxypolis rigidior: *a*, × 8; *b*, × 12.

Type locality, "on the bushy margins of swamps, in the pine forests of North and South Carolina."

Pine barren swamps, from North Carolina to Florida.

Specimens examined:

FLORIDA: Low pine barrens, Apalachicola, *Chapman*; same station, *Curtiss* 1010, November, 1880.

[illegible]

3. **Oxypolis rigidior** (L.) Raf. in Seringe, Bull. Bot. 218. 1830.

[illegible] FIG. 58.

Sium rigidius L. Sp. Pl. **1**: 251. 1753.
Archemora rigida DC. Prodr. **4**: 188. 1830.
Peucedanum rigidum Wood, Bot. & Flor. 136. 1870.
Tiedemannia rigida C. & R. Bot. Gaz. **12**: 74. 1887.

Stem 6 to 15 dm. high; leaves pinnate, 3 to 9-foliolate; leaflets from ovate or lanceolate-oblong to linear-lanceolate, entire or remotely toothed; umbel 15 to 25-rayed, with involucre or few small bracts, and involucels of several setaceous bractlets; rays 3 to 10 cm. long; pedicels 6 to 18 mm. long; fruit oblong, 5 to 7 mm. long; oil tubes 4 to 6 on the commissural side.

Type locality, "Virginia;" collected by *Clayton*.

Swamps from New York to Florida, and west to Minnesota and Louisiana.

Specimens examined:

New York: Erastina, Richmond County, *Pollard*, August 21, 1894.
Pennsylvania: Delaware County.
New Jersey: Port Morris, *Holmes* 393, September 4, 1890.
Maryland: Near Baltimore, *Foreman*, in 1873; same station, *Taylor*, October 15, 1891.
District of Columbia: Washington, *Ward*, September 15, 1875; ~~Tacoma,~~ *Miss E. W. Cathcart*, October 7, 1894.
North Carolina: Highlands, *Boynton*, August, 1888; Roan Mountain, altitude 1,800 to 1,900 meters, *Merriam*, August 8–September 9, 1892.
South Carolina: Aiken, *Ravenel*, August, 1869; Oconee County, *Anderson* 1564, September 15, 1898.
Georgia: Tallulah River, altitude 510 meters, *Small*, August 18–20, 1893.
Florida: Aspalaga, *Chapman*.
Mississippi: Waynesboro, Wayne County, *Pollard* 1246, August 8–9, 1896.
Arkansas: Near Texarkana, Miller County, *A. A. & E. Gertrude Heller* 4128, August 23, 1898.
Missouri: *Bush*, in 1889; near St. Louis, *Glatfelter*, September 8, 1895.
Kentucky: Bell County, *Kearney* 499, September, 1893.
Indiana: Clarke, Lake County, *Umbach*, August 28, 1897.
Illinois: *Brendel*, in 1873.
Iowa: Ames, *Ball* 29, August 15, 1896.
Michigan: Near Hubbardston, *Wheeler*, September 6, 1890.
Wisconsin: Camp Douglas, *Mearns* 397, August 22, 1890.
Minnesota: Fort Snelling, *Mearns* 280, August, 1889 and 1891.

The original specific name of Linnaeus is *rigidius*, the neuter comparative of *rigidus*. In the various shiftings of the name it has been changed to the positive form, *rigidus*, *rigida*, or *rigidum*. We restore the comparative form, which was evidently what Linnaeus intended.

Oxypolis rigidior longifolia (Pursh) Britton, Mem. Torr. Club **5**: 239. 1894.

Sium longifolium Pursh, Fl. **1**: 194. 1814.
Oenanthe ambigua Nutt. Gen. **1**: 189. 1818.
Archemora ambigua DC. Prodr. **4**: 188. 1830.
Archemora rigida ambigua Wood, Class-book, ed. 2, 380. 1860.
Tiedemannia rigida ambigua C. & R. Rev. N. Am. Umbell. 47. 1888.

Leaves elongated, linear, entire; rays fewer; fruit but 4 mm. long.

Type locality, "in ditches and bogs, New Jersey."

From New Jersey to South Carolina and Tennessee.

We have not reexamined this material.

4. **Oxypolis fendleri** (Gray) Heller, Bull. Torr. Bot. Club **24**: 478. 1897.

Archemora fendleri Gray, Pl. Fendl. 56. 1849.
Tiedemannia fendleri C. & R. Rev. N. Am. Umbell. 48. 1888.

Stem slender, simple, 3 to 6 dm. high, from a large fascicle of tubers (2.5 cm. long); leaves pinnate, 5 to 9-foliolate; leaflets ovate or oblong (or lanceolate in upper leaves), obtuse, 2.5 to 5 cm. long, incisely serrate; umbel unequally 5 to 12-rayed, with neither involucre nor involucels; rays 1 to 3.5 cm. long; pedicels 4 to 8 mm. long; fruit ovate, scarcely 4 mm. long, with rather more prominent dorsal and intermediate ribs and narrower lateral wings than in the other species; oil tubes 2 to 4 on the commissural side.

Type locality, "margins of Santa Fe Creek [New Mexico], in fertile soil;" collected by *Fendler*, no. 272, June–July, 1847; type in Herb. Gray.

In the Rocky Mountains from New Mexico to Wyoming.

Specimens examined:

New Mexico: Hermits Peak, *Snow;* near Santa Fe (at type locality), *A. A. & E. Gertrude Heller* 3801, July 2, 1897.

Colorado: Twin Lakes, *Wolf* 723, July, 1873; mountains near timber line, *Alice Eastwood*, July 23, 1890; Steamboat Springs, altitude 2,100 meters, *Crandall*, July 26, 1891; Gypsum Creek Cányon, altitude 2,400 meters, *Crandall*, August 7, 1894; Telluride, altitude 3,000 meters, *Tweedy* 207, August 18, 1894; Cameron Pass, altitude 3,000 meters, *Baker*, July 15, 1896; Bob Creek, southern Colorado, altitude 3,150 meters, *Baker, Earle & Tracy* 851, July 1, 1898.

Wyoming: Centennial Hills, *Nelson* 2697, August 20, 1896; Battle Lake, Carbon County, *Nelson* 4183, August 16, 1897.

5. **Oxypolis occidentalis** C. & R. sp. nov.

Resembling *O. fendleri*, but taller and stouter; leaves 9 to 12-foliolate; leaflets usually larger; umbels with more numerous and more widely spreading equal rays, and involucels of linear bractlets; fruit larger (5 mm. long).

Type locality, in springy meadows west of Crater Lake, Oregon, altitude 1,870 meters; collected by *J. B. Leiberg*, no. 4413, in 1899; type in U. S. Nat. Herb.

Oregon.

Specimens examined:

Oregon: Type specimens as cited under type locality; same station, *Coville & Leiberg* 417, August 15, 1896.

This species is very distinct geographically from its nearest ally, *O. fendleri*.

57. **LEPTOTAENIA** Nutt. in Torr. & Gray, Fl. 1: 629. 1840.

Calyx teeth obsolete or sometimes evident. Fruit flattened dorsally, oblong-elliptical, glabrous. Carpel with dorsal and intermediate ribs filiform or obscure; lateral wings very thick and corky, with large groups of thick-walled strengthening cells; commissural face with a prominent central longitudinal ridge left after separation from the carpophore. Stylopodium wanting. Oil tubes 3 to 6 in the intervals, 4 to 6 on the commissural side, mostly small, sometimes obsolete. Seed very flat, with plane or slightly concave face.

Usually tall and stout glabrous nearly acaulescent perennials, with thick often very large fusiform roots, usually large pinnately decompound leaves, involucre of few bracts or none, involucels of numerous small bractlets, and yellow or purple flowers.

First species cited, *Leptotaenia dissecta* Nutt.

A genus of 11 species, belonging to western United States and British Columbia.

For a critical discussion of this genus in relation to its allies, see our Revision N. Am. Umbell. 50.

Foliage puberulent.
Fruit sessile or nearly so; staminate flowers on slender pedicels.
Flowers purple .... 1. *L. dissecta.*
Flowers yellow .... 2. *L. foliosa.*
Fruit with pedicels longer than those of the staminate flowers.
Fruit usually 8 to 12 mm. long; leaves finely dissected .... 3. *L. multifida.*
Fruit larger; foliage less dissected .... 4. *L. eatoni.*
Foliage glabrous.
Leaves finely dissected.
Involucels conspicuous and more or less united.
Bractlets obovate, toothed near apex .... 5. *L. anomala.*
Bractlets lanceolate, entire .... 6. *L. humilis.*
Involucels neither conspicuous nor united.
Fruit broadly oblong (10 to 12 mm. broad); lateral wings prominent and thick; oil tubes conspicuous, 3 in the intervals; leaflets filiform. 7. *L. purpurea.*
Fruit narrowly oblong (4 to 6 mm. broad) or short-oblong; lateral wings not prominent; oil tubes inconspicuous, mostly solitary in the intervals or wanting; leaflets shorter.
Fruit short-oblong; peduncles slender.
Leaflets rigid, pungent; flowers purple; Washington ...... 8. *L. watsoni.*
Leaflets thin, not rigid.
Flowers salmon color; pedicels long .... 9. *L. salmoniflora.*
Flowers deep yellow; pedicels short .... 10. *L. leibergii.*
Fruit narrowly oblong; peduncles enlarged andturgid .... 11. *L. minor.*
Leaflets broad .... 12. *L. californica.*

1. **Leptotaenia dissecta** Nutt. in Torr. & Gray, Fl. **1**: 630. 1840.

Ferula dissecta Gray, Proc. Am. Acad. **7**: 348. 1868.
Ferula dissoluta Watson, Bot. Calif. **1**: 271. 1876.

About 3 to 9 dm. high, leafy at base; leaves broad, 3 dm. or so long, ternate and thrice pinnate; segments ovate or oblong, 1 to 2.5 cm. long, pinnatifidly laciniate-lobed and toothed, puberulent on the veins (beneath) and margins; umbel 8 to 20-rayed, with an involucre of few linear bracts and involucels of several linear bractlets; rays 5 to 13 cm. long; flowers purple; sterile flowers pedicelled; fruit sessile or nearly so, 10 to 18 mm. long, about 6 mm. broad; strengthening cells in the distinct filiform dorsal and intermediate ribs, as well as in the laterals; seed face plane.

Type locality, "plains of the Oregon [Columbia] near the confluence of the Wahlamet;" collected by *Nuttall;* type in Herb. Philad. Acad.

From northern California to Vancouver Island.

Specimens examined:

CALIFORNIA: Sisson, Siskiyou County, *Brown*, in 1897.
OREGON: Edge of prairies, *Howell*, July, 1880.

WASHINGTON: *Suksdorf*, in 1881; rocky hillsides, Columbia River, Klickitat County, *Suksdorf* 1209, March 30, 1886.
BRITISH COLUMBIA: Gordon Head, Vancouver Island, *Macoun*, May 30, 1887.

2. **Leptotaenia foliosa** (Hook.) C. & R.

Leptotaenia dissecta foliosa Hook. Lond. Jour. Bot. **6**: 236. 1847.

Acaulescent, 6 dm. high, glabrous and somewhat glaucous; leaves 2 to 3 times ternate then pinnately compound, the ultimate segments linear and entire or cut into linear lobes, often obtuse, only slightly puberulent on midrib and margins; umbel 8 to 22-rayed, with an involucre of several linear bracts, and involucels of few linear bractlets; flowers yellow; sterile flowers on slender pedicels; fruit (immature) on very short pedicels, glaucous.

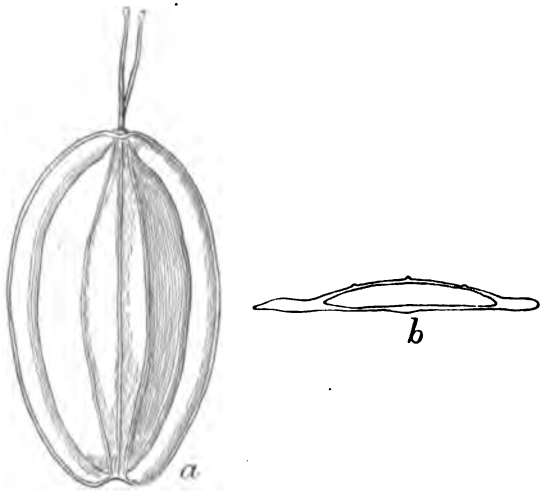


FIG. 59.—Leptotaenia multifida: *a*, × 4; *b*, × 6.

Type locality, "fertile slopes of the mountains [Nez Perces, Idaho], near the snow line;" collected by *Geyer*, no. 517.

Western Idaho.

Specimens examined:

IDAHO: Nez Perces County, about Lake Waha, *Sandberg* 227, May 27, 1892.

This species seems quite distinct from *L. dissecta* and has a very different range. We have not seen Geyer's plant, but it came from the same locality as the material collected by Sandberg.

3. **Leptotaenia multifida** Nutt. in Torr. & Gray, Fl. **1**: 630. 1840.
FIG. 59.

Ferula multifida Gray, Proc. Am. Acad. **7**: 348. 1868.

Resembling *L. dissecta*, but with more finely divided leaves; umbels mostly without involucre; flowers purple or yellow; pedicels of the fruit 6 to 24 mm. long; fruit 8 to 12 mm. long, and with no strengthening cells in the almost obsolete dorsal and intermediate ribs; seed face concave, the carpel section being crescentic.

Type locality, "plains of the Oregon [Columbia], east of Wallawallah, and in the Blue Mountains;" collected by *Nuttall;* type in Herb. Philad. Acad.

From western Wyoming and Montana to New Mexico and west to Washington and California.

Specimens examined:

WYOMING: Druid Peak, Yellowstone Park, *A. & E. Nelson* 5777, July 12, 1899.

MONTANA: Helena, *Kelsey*, May, 1887; *Tweedy*, in 1889; near Red Lodge, *Rose* 10, July 24–25, 1893; Columbia Falls, *Williams* 194, June–July, 1894; Flathead County, *Holzinger & Blake* 11, July 16–19, 1898.

WYOMING: Fort Bridger, *Porter*, July 8, 1873; Yellowstone Park, *Tweedy*, in 1885.

COLORADO: Durango, *Alice Eastwood*, June 5, 1890; Routt County, *Crandall* 22, July 16, 1894; Glenwood Springs, *Osterhout*, June, 1895; Baldwin, *Bethel* 25*a*, June 19, 1897; near Dix, La Plata County, *Baker, Earle & Tracy* 662, July 10, 1898; Durango *Bethel* 25*b*, June 28, 1898.

ARIZONA: About Mormon Lake, *MacDougal* 58, June 11, 1898.

NEVADA: Trinity Mountains, *Watson* 460, May, 1868; Carson City, *Jones* 3878, May 23, 1882; Ruby Hill, *Jones*, July 8, 1891; Aurum, *Jones*, May 20, 1893.

IDAHO: *Leiberg*, in 1892; Blue Lakes, *Palmer* 84, June 2, 1893.

WASHINGTON: *G. R. Vasey*, in 1883 and 1889; Yakima County, *Henderson* 2579, June 14, 1892; *Sandberg & Leiberg* 54, 212, in 1893; Whitman County, *Elmer* 136, May, 1897.

OREGON: *Cusick*, in 1884 and 1898; Morrow County, *Leiberg* 50, May 10, 1894.

CALIFORNIA: Sierra Nevada, *Lemmon*, in 1875; San Bernardino Mountains, *G. R. Vasey*, May, 1880; Sierra County, *Lemmon*, June, 1886 and 1889; Summit, Placer County, *Alice Eastwood*, June, 1898.

A specimen collected by *Mrs. Katharine Brandegee* at Tehachapi, Cal., June, 1884, is probably best referred to this species, but it has coarser foliage, and fruit 16 mm. long.

4. **Leptotaenia eatoni** C. & R. Rev. N. Am. Umbell. 52. 1888.

Like *L. multifida*, but with less dissected leaves; umbels few-rayed; pedicels of fruit 8 to 12 mm. long; fruit 16 to 18 mm. long, 8 to 10 mm. broad, flatter and thinner than in any other species; oil tubes 4 to 6 in the intervals, 4 on the commissural side, a prominent corky nerve on the commissural face of the lateral wing near the inner margin; seed face plane.

Type locality, "Utah;" collected by *D. C. Eaton*, no. 147, June-July, 1869; type in Herb. Coulter.

Specimens examined:

UTAH: Type specimens as cited under type locality; Silver Reef, altitude 1,350 meters, *Jones* 5176, May, 1894; head of Salina Canyon, altitude 2,400 meters, *Jones* 5441, June 15, 1894.

IDAHO: Cuddy Mountains, *Jones*, July 11, 1899.

WYOMING: Evanston, Uinta County, *Nelson* 2982, May 29, 1897.

We have not been able to reexamine the type, but the above specimens seem to be referable to this species.

5. **Leptotaenia anomala** C. & R. Rev. N. Am. Umbell. 53. 1888.

Acaulescent, glabrous, with slender scape (15 to 30 cm. high) bearing an unequally 3 to 6-rayed umbel; leaves slender-petioled, pinnate with few distant very narrowly linear divisions; umbel with no involucre. and involucels of prominent scarious-margined veiny bractlets more or less united; rays 2.5 to 7.5 cm. long; pedicels hardly 2 mm. long; fruit small, in nearly sessile clusters of 2 to 8, oblong, 8 mm. long, about 4 mm. broad, the lateral ribs considerably thicker than the body, the dorsal and intermediates very slender filiform to obsolete, occasionally with minute calyx teeth; oil tubes none; the commissural ridge small or almost wanting.

Type locality, "Carbondale [Mount Diablo region], California;" collected by *M. K. Curran*, May, 1886; type in Herb. Coulter.

Only known from the type locality.

Specimens examined:

CALIFORNIA: Type locality, *Brandegee*, April–June, 1889; same station, from *Herb. Greene*, April 6, 1894.

6. **Leptotaenia humilis** C. & R., sp. nov.

Low, acaulescent, glabrous throughout; leaves about 3 times ternate, ultimate segments elongated, linear, entire; peduncle 1 to 2 dm. long; rays very unequal, 2 to 5 cm. long; pedicels 1 to 7 mm. long; involucre none; bractlets of the involucel linear to lanceolate, acuminate, scarious-margined; fruit oblong, 6 mm. long, the wings very thick and corky.

Type locality, plains near Chico, Butte County, Cal.: collected by *Mrs. C. C. Bruce*, no. 2661, May, 1897; type in Herb. Cal. Acad. Sci., fragment and photograph in U. S. Nat. Herb.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; also Little Chico Creek, *Mrs. Austin* 257, in 1896.

This species is nearest *L. anomala*, but certainly very distinct.

7. **Leptotaenia purpurea** (Watson) C. & R. Rev. N. Am. Umbell. 52. 1888.

Ferula purpurea Watson, Proc. Am. Acad. **21** : 453. 1886.

About 3 dm. high; leaves completely glabrous, very much dissected, the ultimate segments linear or filiform; umbel 8 to 20-rayed, with no involucre, and involucels of several linear acuminate bractlets; rays 7.5 to 10 cm. long; flowers purple; fruit 18 to 24 mm. long, as long as the pedicels, 10 to 12 mm. broad, with a much more prominent corky margin and commissural ridge than in any other species; oil tubes prominent, 3 in the intervals of the distinct dorsal and intermediate ribs, 4 on the commissural side.

Type locality, "on rocky hillsides near the lower Columbia River, in Klickitat County, Wash.," collected by *Suksdorf*, no. 281, March 21, 1880; type in Herb. Gray. Associated with the type in the original description are *Howell* of 1879 and *Mrs. P. G. Barrett* of 1884, both cited below.

Rocky hillsides near the Columbia, in Washington and Oregon, chiefly between Hood River and the Dalles.

Specimens examined:

WASHINGTON: Simcoe Mountains, *Howell*, June, 1879; type specimens as cited under type locality; same station, *Suksdorf* 26, March (flower) and June (fruit), 1881; near the Dalles, *Henderson*, in 1892.

OREGON: Near the Dalles, *Howell*, May, 1880; Hood River, *Mrs. P. G. Barrett*, in 1884.

Mr. Howell writes that this species seems to be very local, probably being restricted to a region less than 20 miles square.

8. **Leptotaenia watsoni** C. & R. Rev. N. Am. Umbell. 52. 1888.

About 3 dm. high or less, rather stout, somewhat branching; leaves few and small, at or near the base, ternate-pinnately decompound. the ultimate segments very small, ovate and cuspidate; umbel with 5 to 10 variously elongated divaricate rays, no involucre, and involucels of few setaceous bractlets; rays 5 to 10 cm. long; fruiting pedicels (2 to 8 or 10 in number) about 1 cm. long and divaricate; fruit (immature) 12 mm. long; oil tubes 3 in the intervals; seed face concave.

Type locality, "in the Wenatchee region," Kittitas County, Wash., altitude 1,200 meters; collected by *Brandegee*, no. 801, and *Tweedy*, no. 848, July, 1883; type in Herb. Canby (now in College of Pharmacy, New York City).

Only known in the region of the type locality.

Specimens examined:

WASHINGTON: Type specimens as cited under type locality; slopes of Mount Stuart (Cascades), Wenatchee Valley, altitude 1,220 meters, *Sandberg & Leiberg* 808, August 28, 1893; same station, altitude 1,950 meters, *Elmer* 1171, July, 1898.

9. **Leptotaenia salmoniflora** C. & R.

Peucedanum salmoniflorum C. & R. Contr. Nat. Herb. **3**: 228. 1895.

Short caulescent or sometimes tall, 3 to 4.5 dm. high, bearing 3 or 4 leaves, glabrous throughout; leaves large, ternately decompound, finely dissected; ultimate segments short-filiform; umbel few (4 to 10) and somewhat unequally-rayed, with no involucre, and involucels of few filiform bractlets; rays 2.5 to 5 cm. long; pedicels 8 to 12 mm. long; flowers salmon color; fruit oblong, 10 mm. long; dorsal and intermediate ribs low and obtuse; lateral wings narrow; oil tubes solitary in the intervals, 2 on the commissural side; seed somewhat constricted near the middle.

Type locality, "on basaltic rocks, near upper ferry, Clearwater River, above Lewiston," Nez Perces County, Idaho; collected by *Sandberg*, no. 24, April 24, 1892; type in U. S. Nat. Herb.

On basaltic rocks, Nez Perces County, Idaho, and eastern Washington (Whitman County).

Specimens examined:

IDAHO: Type specimens as cited under type locality.

WASHINGTON: Basaltic cliffs, Wawawai, Whitman County, *Piper* 2782, April 17, 1897.

10. **Leptotaenia leibergi** C. & R., sp. nov. PLATE VII.

Low caulescent plants from rather large shallow tuberous roots; peduncles elongated, 15 to 25 cm. long, erect or somewhat spreading, glabrous; leaves ternately dissected, the ultimate segments linear, 4 to 8 mm. long; flowering umbels very much contracted; fruiting umbels rather irregular, with no involucre, and involucels of 3 or 4 small bractlets; longer rays 3 cm. long; pedicels 4 to 6 mm. long; flowers deep yellow; fruit oblong, 6 to 8 mm. long, 4 mm. broad, with filiform dorsal and intermediate ribs, and narrow rather thickish laterals; oil tubes indistinct, perhaps solitary in the intervals, and 2 on the commissural side.

Type locality, wet adobe soils of Barren Valley, Malheur County, Oregon, where it is said to be common; collected by *Leiberg*, no. 2197, June, 1896; type in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:

OREGON: Type specimens as cited under type locality.

EXPLANATION OF PLATE VII.—Fig. *a*, dorsal view of carpel.

11. **Leptotaenia minor** Rose; Howell, Fl. N. W. Am. **1**: 251. 1898.

Acaulescent or nearly so, glabrous throughout, from large branching and somewhat starchy roots; leaves 15 to 20 cm. long (including the petiole), finely dissected, with short linear acute ultimate segments and an inconspicuous stipular sheath; peduncle thick and turgid, especially at maturity, 15 to 20 cm. long, somewhat glaucous; umbel unequally-rayed, with no involucre, and involucels of several linear bractlets; rays 2 to 6 cm. long; pedicels 10 to 14 mm. long; flowers light purple; fruit oblong, 14 to 16 mm. long, 5 to 7 mm. wide; oil tubes 1 or 2 in the intervals, not conspicuous.

Type locality, near Rock Creek, Morrow County, "John Day Country, Oregon," altitude 1,040 meters; collected by *Leiberg*, no. 98, May 22, 1894; type in U. S. Nat. Herb.

Eastern Oregon.

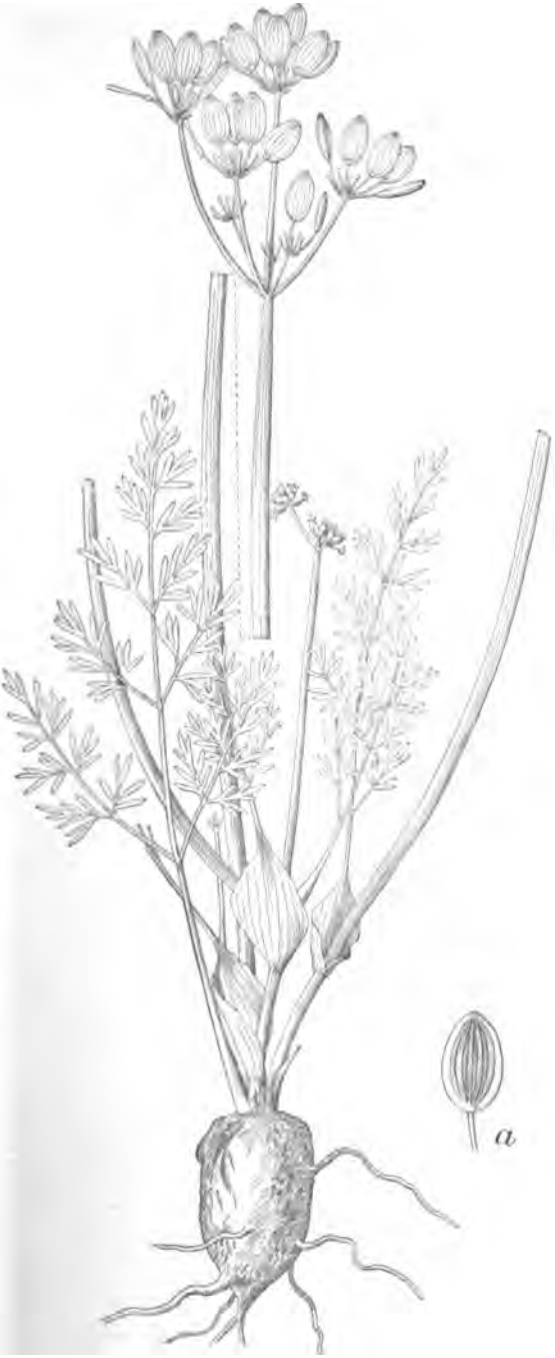
Specimens examined:

OREGON: Type specimens as cited under type locality; Lost Valley, *Howell* 414, May, 1882; near Antelope, *Howell* 421, May 10, 1885.

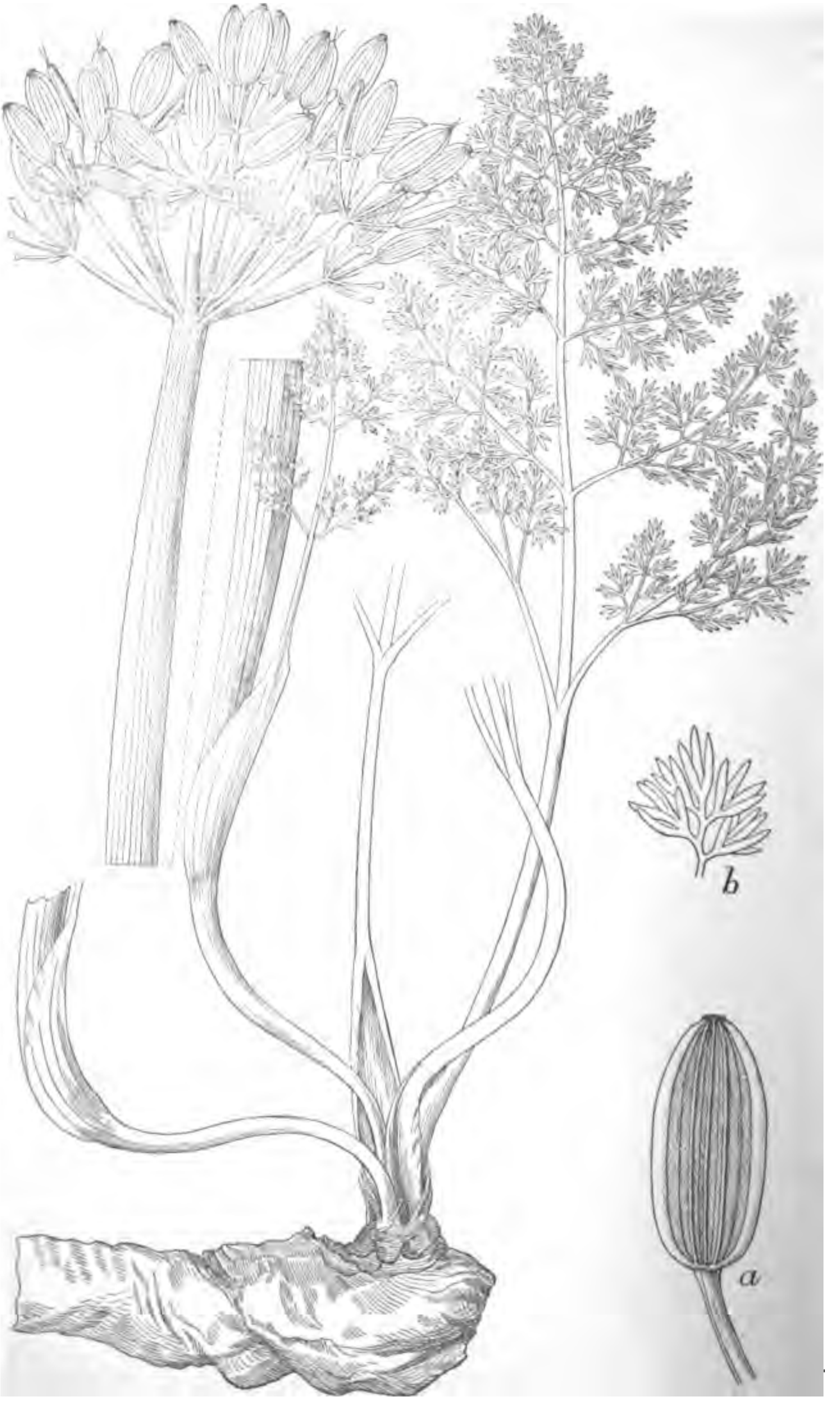
EXPLANATION OF PLATE VIII.—Fig. *a*, dorsal view of carpel; *b*, enlarged view of tip of leaf.

Howell 414, from Lost Valley, was distributed as *L. purpurea*, and seems to have been included by Watson in his original description of that species.

In habit this species much resembles *L. purpurea*, but the leaflets are much shorter, the fruit is very different, while it lacks the large purple sheathing bracts at the base of the stem. The fruit is more like that of *L. watsoni* and *L. salmoniflora*, but is very distinct from either.



LEPTOTAENIA LEIBERGI C. & R., sp. nov.



LEPTOTAENIA MINOR ROSE.

In Mr. Leiberg's field notes is the following interesting description of the habitat: "The species was found on the high basaltic table-lands which form the western spurs of the Blue Mountains in Gilliam and Morrow counties, Oregon, at altitudes varying from 900 to 1,200 meters. It is a very striking and peculiar plant in the flora of that region, owing partly to its aspect and partly to the close limitation of its habitat. On the summits of the plateaus and along the upper slopes where they break off to the great canyons that cut them, are found in large numbers long, sinuous, narrow lines of basaltic talus that meander in all directions through the otherwise grassy or turfy plateau. These lines of talus mark the existence of shallow depressions in the lava sheet, and form the drainage channels of the more level portion of the table-lands. Among the loose rocks of these drainage channels grows the plant. The large starchy roots lie horizontally and rather loosely among the rocks at a depth varying from about 5 to 12 cm. There is no soil about them except a slight covering of closely adhering mud deposited by the percolating waters."

Mr. Howell also writes that this species is very local, "probably not growing outside of a district 50 miles square."

12. **Leptotaenia californica** Nutt. in Torr. & Gray, Fl. **1**: 630. 1840.

Ferula californica Gray, Proc. Am. Acad. **7**: 348. 1868.

About 6 dm. high, glabrous throughout, with 1 or 2 stem leaves; leaves ternate and pinnate or twice ternate; leaflets cuneate-obovate, 2.5 to 5 cm. long, usually 3-lobed, coarsely toothed above; umbel 15 to 20-rayed, with involucre of 1 or 2 narrow bracts or none, and no involucels; rays 5 to 10 cm. long; pedicels 4 to 8 mm. long; flowers yellow; fruit 10 to 14 mm. long, 6 to 8 mm. broad, with narrower laterals than in any other species; dorsal and intermediate ribs indistinct; oil tubes 3 or 4 in the intervals, 6 on the commissural side.

Type locality, "Santa Barbara, Upper California;" collected by *Nuttall.*

California and adjacent Oregon.

Specimens examined:

CALIFORNIA: Borax Lake, *Torrey* 168, in 1865; *Kellogg & Harford* 318, in 1868–69; near Fort Tejon, Kern County, altitude 1,000 meters, *Coville & Funston* 1162, July 2, 1891; Pah-Ute Peak, southeastern California, altitude 1,800 to 2,100 meters, *Purpus* 5092, April–September, 1897.

OREGON: Grave Creek, *Howell*, May 21, 1884; Rogue River Valley, *Howell*, April 15, 1887; near Little Klamath Lake, Klamath County, altitude 1,290 meters, *Applegate* 2033, May 11, 1898.

The specimens of Oregon differ somewhat from the Californian forms, being more glaucous, with larger fruit (14 mm.) and broader laterals.

Leptotaenia californica platycarpa Jepson, Erythea **1**: 8. 1893.

Caulescent, 12 dm. high; leaves biternate then pinnate, with dilated petioles; leaflets cuneate-obovate, 3-lobed or the terminal 3-parted, the lobes coarsely toothed; rays equal, 5 to 7.5 cm. long; pedicels 10 mm. long; fruit oblong-ovoid, 14 mm. long, 10 mm. broad, broadly winged, emarginate at both ends; oil tubes 3 in the intervals, 6 on the commissural side.

Type locality, "Gates Canyon, Vaca Mountains," California, altitude 400 meters; collected by *Jepson*, March 25 (in flower) and June 20 (in fruit), 1892; type in Herb. Univ. Calif.

We have not seen this plant, and simply adapt the original description.

Leptotaenia californica dilatata Jepson, Erythea **1**: 63. 1893.

"Leaves nearly as in the type; peduncles at summit abruptly widened into a disciform dilatation 9 lines in diameter; fruit 7 lines long, 5 lines wide, narrowly margined; oil tubes anastomosing."

Type locality not given; collected by *Bolander*, no. 652~~9~~, presuma- 6
bly in California; type in Herb. Univ. Calif.

We have seen no specimens.

58. LOMATIUM Raf. Jour. Phys. 89: 101. 1819.

Cogswellia Spreng. in Roem. & Schult. Syst. **6**: xlviii. 1820.
Peucedanum L. as to North American species.

Calyx teeth obsolete (very rarely evident). Fruit strongly flattened dorsally, oblong to orbicular. Carpel with filiform and approximate dorsal and intermediate ribs, and winged laterals coherent till maturity with those of the other carpel; pericarp thin, with strengthening cells beneath each rib and nerve. Stylopodium wanting. Oil tubes one to several in the intervals (rarely obsolete), 2 to 10 on the commissural side. Seed dorsally flattened, with plane face (rarely slightly concave).

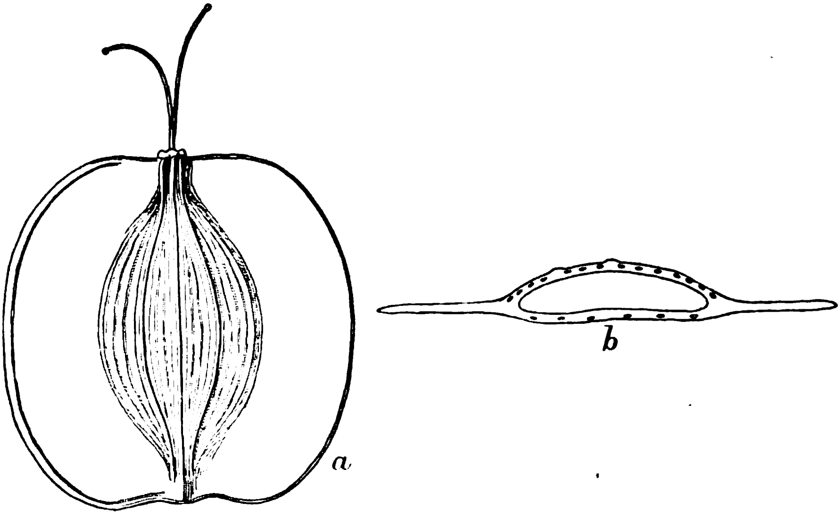


FIG. 60.—Lomatium nevadense: *a*, × 3; *b*, × 4.

Acaulescent or short caulescent dry ground perennials, with fusiform or tuberous roots, ternate (sometimes pinnate) to dissected leaves, no involucre, involucels mostly present, and yellow, white, or purple flowers.

Type species, *Lomatium villosum* Raf.

A genus of about 60 species, belonging to the drier regions of Western North America.

While preparing our Revision of 1888, we recognized that the North American species referred to *Peucedanum* differ from the European and Asiatic representatives of the genus, and our manuscript was prepared with our species segregated from *Peucedanum*. At the last moment we concluded not to make the change until further knowledge of our species and those of the Old World had been obtained. The twelve years that have elapsed have but strengthened our earlier view, and we hesitate no longer in making a change in which we are also confirmed by the views of other American botanists.

The genus *Peucedanum* was treated by Bentham and Hooker as a vast and unwieldy complex, under which in the Kew Index 40 generic names appear as synonyms. The restoration of these genera has been going on ever since, those with which we are concerned being *Anethum*, *Imperatoria*, *Oxypolis* (*Archemora*, *Tiedemannia*, *Neurophyllum*), and *Pastinaca*, to which we now add *Lomatium* (*Cogswellia*), and *Euryptera*, the list including 10 of the generic names cited by the Kew Index as synonyms of *Peucedanum*.

The type of *Peucedanum* is *P. officinale* L. Sp. Pl. **1**: 245. 1753, a plant of the low fertile meadows of Europe, and is of an entirely different generic type from the North American species which have been referred to *Peucedanum*, and which represent a very consistent group entirely restricted to Western North America, and form by far our largest and most characteristic umbelliferous genus. Briefly stated, the essential differences between *Peucedanum* and *Lomatium* are as follows: *Peucedanum* consists of tall and branching mesophytic plants of low fertile meadows of the Old World, with several umbels, conical stylopodium, and solitary oil tubes; while *Lomatium* consists of low xerophytic plants of acaulescent habit belonging to the arid regions of Western North America, with usually single umbels terminating simple elongated peduncles, no stylopodium, and often several oil tubes.

The name *Cogswellia* was given by Sprengel because he regarded Rafinesque's *Lomatium* as a homonym. Rafinesque characterizes (Jour. Phys. **89**: 101. 1819) the genus as follows:

"*Lomatium.* (Ombellif.) Fleurs polygames mâles, à involucelles et sans involucres. Fleurs hermaphrodites. Calice ou ovaire comprimé, entier. 5 pétales fléchis, menus. 5 étamines. 2 styles. Semences plates, elliptiques, entières, à peine striées, entourées par une aile membraneuse marginale.--Acaulé, feuilles decomposées, hampe à une ombelle, involucelles polyphylles, les ombellules centrales à fleurs mâles.—Je fonde ce genre sur une jolie plante recueillie sur le Missouri par M. Bradbury, qui me l'a communiquée. Il diffère du genre *Heracleum* par les semences entières, etc., et se rapproche par son port des genres *Athamanta* et *Cymopterus*.

L. villosum. Entièrement velue, feuilles quadripinnées, pétioles membraneux, folioles lancéolées, aiguës, laciniées; hampe plus longue que les feuilles; involucelles lancéolées, aiguës, tomenteuses. Fleurs blanches."

The identification of Bradbury's plant is a matter of inference rather than a certainty. The description calls for a villous plant with white flowers and tomentose involucels, and, unfortunately, no species of *Lomatium* which occurs in the region of Bradbury's collection shows such a combination. *L. orientale* (for synonymy see under species) was collected by Bradbury, and has white flowers, but it is a plant with short soft pubescence and smooth involucels; while *L. foeniculaceum* is a villous plant with tomentose involucels, but has yellow flowers. *L. macrocarpum* is a villous plant and has white flowers, but it is farther west than Bradbury reached. It would seem, therefore, that *Lomatium villosum* Raf. is either *L. orientale* or *L. foeniculaceum*, and it is more reasonable to suppose that yellow flowers might have been mistaken for white in an herbarium specimen than that a pubescent plant with glabrous involucels could have been said to be villous and with tomentose involucels.

The only other species of *Lomatium* which grows in the east is *L. daucifolium* (*P. foeniculaceum* of most writers, but not of Nuttall), but that has yellow flowers, and seems not to grow far enough north to be *L. foeniculaceum*. This is doubtless the same species as the *Peucedanum villosum* Nutt., taken up by Watson from Nuttall MS.

Some explanation of these eastern plains species of Nuttall (*P. foeniculaceum* and *P. villosum*) may be helpful to a clearer understanding of the question. Bradbury and Nuttall collected together in the upper Missouri, in what is now North Dakota. Rafinesque named Bradbury's plants, and Nuttall named his own. From the same region Rafinesque described *Lomatium villosum*, and Nuttall described *Ferula foeniculacea*. The earlier botanists, as Hooker, DeCandolle, etc., regarded them as the same, and there seems to be no reason to doubt this conclusion. Torrey and Gray, however, included with Nuttall's *Ferula foeniculacea* (as var. *daucifolia*) forms from the more southern plains, and the name has been gradually shifted to them, so that now in the United States National Herbarium the specimens labelled *Peucedanum foeniculaceum* extend from Nebraska to Texas, entirely south of the type locality of Nuttall's *Ferula foeniculacea*. In the meantime, Watson took up *Peucedanum villosum*, a manuscript name of Nuttall's applied to a plant from "the plains of the Platte," in Nebraska, and made it to include also plants from the far West.

A reasonable conclusion seems to be that *Lomatium villosum* Raf. represents the plants of the northern plains which have been going under the name of *Peucedanum villosum* Nutt., and which are Nuttall's *Ferula foeniculacea;* and that the plants of the more southern plains which have been called *Peucedanum foeniculaceum* represent another species. The type species of *Lomatium*, therefore, is *L. foeniculaceum* as defined in this paper.

Mostly low, from globose tubers; leaves small, more or less dissected.

FLOWERS WHITE.

Fruit puberulent .... 1. *L. gormani*.

Fruit glabrous.

Oil tubes none .... 2. *L. geyeri*.

Oil tubes present.

Oil tubes solitary in the intervals.

Lateral wings thickish .... 3. *L. hendersonii*.

Lateral wings thin .... 4. *L canbyi*.

Oil tubes several in the intervals.

Pedicels slender, longer than the fruit .... 5. *L. farinosum*.

Pedicels very short, much shorter than the fruit .... 6. *L. piperi*.

FLOWERS YELLOW.

Fruit puberulent .... 7. *L. watsoni*.

Fruit glabrous (except in *L. cous*).

Fruit linear.

Umbellets open; pedicels slender (4 to 8 mm. long) .... 8. *L. ambiguum*.

Umbellets compact; fruit nearly sessile .... 9. *L. leptocarpum*.

Fruit oblong.

Rather tall, caulescent .... 10. *L. circumdatum*.

Low, acaulescent.

Oil tubes solitary in the intervals; fruit pubescent .... 11. *L. cous*.

Oil tubes several in the intervals; fruit glabrous .... 12. *L. montanum*.

Usually stouter than the last, from more or less thickened roots.

PEDUNCLES USUALLY SLENDER, NEVER SWOLLEN AT THE TOP.

BRACTLETS OF INVOLUCEL CONSPICUOUS, OFTEN BROAD OR UNITED AT BASE.

- *Bractlets generally obovate.*
  - Oil tubes large, solitary in the intervals.
    - Fruit small (4 to 10 mm. long) .... 13. *L. utriculatum.*
    - Fruit larger (12 to 14 mm. long) .... 14. *L. vaseyi.*
  - Oil tubes indistinct, several in the intervals .... 15. *L. caruifolium.*
- *Bractlets not obovate.*
  - FLOWERS WHITE.
    - Bractlets not scarious at margin, but more or less tomentose or villous.
      - Fruit glabrous.
        - Fruit with lateral wings much broader than body .... 16. *L. ellipticum.*
        - Fruit with lateral wings as broad as body or narrower. 17. *L. macrocarpum.*
      - Fruit tomentose.
        - Oil tubes solitary in the intervals .... 18. *L. dasycarpum.*
        - Oil tubes usually 3 in the intervals .... 19. *L. tomentosum.*
    - Bractlets scarious margined, not tomentose.
      - Oil tubes solitary in the intervals; fruit glabrous .... 20. *L. orientale.*
      - Oil tubes several in the intervals; fruit pubescent .... 21. *L. nevadense.*
  - FLOWERS YELLOW.
    - Involucels pubescent.
      - Fruit glabrous .... 22. *L. daucifolium.*
      - Fruit pubescent .... 23. *L. foeniculaceum.*
    - Involucels glabrous.
      - Somewhat scabrous; pedicels 4 to 7 mm .... 24. *L. vaginatum.*
      - Glabrous; pedicels 10 to 12 mm .... 25. *L. marginatum.*

- BRACTLETS OF INVOLUCEL SMALL OR WANTING.
  - **Fruit** from narrowly to broadly oblong.
    - *Leaves narrow in outline, generally pinnate.*
      - Fruit puberulent .... 26. *L. oreganum.*
      - Fruit glabrous.
        - Oil tubes more than one in the intervals .... 27. *L. hallii.*
        - Oil tubes solitary in the intervals.
          - Flowers deep yellow; leaf segments minute .... 28. *L. leibergi.*
          - Flowers pale yellow; leaf segments much longer than the last. 29. *L. martindalei.*
    - *Leaves broad in outline, with primary divisions at least ternate.*
      - *Leaves* rather simply 1 to 3-ternate.
        - Wings broad.
          - Oil tubes always solitary in the intervals .... 30. *L. laevigatum.*
          - Oil tubes mostly more than one in the intervals.
            - Low dwarf glabrous plants .... 31. *L. cusickii.*
            - Taller and puberulent .... 32. *L. platycarpum.*
        - Wings narrow.
          - Ovaries glabrous .... 33. *L. triternatum.*
          - Ovaries puberulent.
            - Ribs filiform .... 34. *L. robustius.*
            - Ribs sharp .... 35. *L. alatum.*
      - *Leaves* usually much dissected and with short segments.
        - *Glabrous* throughout.
          - Flowers yellow.
            - Oil tubes solitary in intervals.
              - Fruit wings broad .... 36. *L. grayi.*
              - Fruit wings narrow .... 37. *L. torreyi.*

Oil tubes several in intervals.

Petioles with white scarious margins .... 38. *L. sandbergii.*

Petioles without white scarious margins.

Fruit narrowly oblong; wings very narrow .. 39. *L. microcarpum.*

Fruit broadly oblong; wings broadish .... 40. *L. donnellii.*

Flowers not yellow.

Pedicels very short (2 mm. long) .... 41. *L. lemmoni.*

Pedicels elongated (6 mm. or more long).

Involucels wanting .... 42. *L. congdoni.*

Involucel bractlets present .... 43. *L. plummerae.*

Pubescent throughout.

Ovary and usually the fruit pubescent.

Fruit glabrous .... 44. *L. brevifolium.*

Fruit pubescent.

Herbage softly pubescent.

Wings of fruit narrow .... 45. *L. macdougali.*

Wings of fruit broad .... 46. *L. jonesii.*

Herbage coarsely pubescent.

Fruit wings broad .... 47. *L. mohavense.*

Fruit wings narrow .... 48. *L. argense.*

Ovary and fruit glabrous.

Oil tubes several in all the intervals.

Flowers white .... 49. *L. parishii.*

Flowers yellow .... 50. *L. juniperinum.*

Oil tubes solitary in all or some of the intervals.

Flowers purple .... 51. *L. austinae.*

Flowers yellow .... 52. *L. sonnei.*

Fruit linear .... 53. *L. bicolor.*

PEDUNCLE STOUT, SOMETIMES MUCH SWOLLEN AT THE TOP.

Fruit of medium size.

More or less puberulent .... 54. *L. anomalum.*

Glabrous throughout.

Oil tubes several in the intervals .... 55. *L. platyphyllum.*

Oil tubes solitary in the intervals .... 56. *L. nudicaule.*

Fruit very large.

Ovary glabrous .... 57. *L. suksdorfii.*

Ovary pubescent .... 58. *L. giganteum.*

1. **Lomatium gormani** (Howell) C. & R.

Peucedanum gormani Howell, Fl. N. W. Am. **1**: 252. 1898 [April 1].
Peucedanum confusum Piper, Erythea **6**: 29. 1898 [April 10].

Acaulescent, glabrous or pubescent, 5 to 7.5 cm. high from a shallow globose tuber 2.5 cm. or less in diameter and covered with fascicles of rootlets; leaves bipinnate, the ultimate segments oblong or linear; umbel unequally 1 to 5-rayed, with involucels of a few setaceous bractlets or none; flowers white; fruit sessile or nearly so, rough puberulent, ovate, 6 mm. long, with wings more than half as broad as body, and evident dorsal and intermediate ribs; oil tubes 2 to 6 on the commissural side.

Type locality, on "high hills opposite The Dalles," Oregon; collected by *Howell*, May, 1882; type in Herb. Coulter.

Mountains of eastern Oregon, eastern Washington, and adjacent Idaho.

Specimens examined:

Oregon: Type specimens as cited under type locality.

Washington: Spokane County, *Leiberg* 750, May, 1891; *Sandberg & Leiberg* 84, in 1893; Pullman, Whitman County, *Piper* 1565, May 24, 1894; Waitsburg, Walla Walla County, *Horner* 4, April 16, 1897; moist rocky plains on the Palouse Hills, Whitman County, *Piper* 73, May, 1897 (type of *Peucedanum confusum* Piper).

Idaho: Lewiston, Nez Perces County, *A. A. & E. Gertrude Heller* 2967, April 27, 1896.

This species is said to be very common, and the earliest spring flower in the region.

2. **Lomatium geyeri** (Watson) C. & R.

Peucedanum geyeri Watson, Proc. Am. Acad. **14**: 293. 1879.
Peucedanum evittatum C. & R. Bot. Gaz. **14**: 277. 1889.

Acaulescent, 1 to 4.5 cm. high, from a deep-seated small tuber, glabrous; leaves once or twice ternate then more or less pinnate into linear callous-tipped segments 1 to 5 cm. long; umbel somewhat unequally 8 to 18-rayed, with involucels of numerous purplish lanceolate acuminate united bractlets; rays 2.5 to 5 cm. long; pedicels short, 2 to 3 mm. long; flowers white; fruit oblong, glabrous, 8 to 10 mm. long, 5 mm. broad, with very thin membranous wings more than half as broad as body; oil tubes none.

Type locality, sandy woods and plains, Upper Columbia River, eastern Washington; collected by *Geyer*, no. 458; type in Herb. Gray. Associated with the type in the original description is *Spalding* from Clearwater, Idaho, but this belongs elsewhere.

Eastern Washington and northern Idaho.

Specimens examined:

Washington: Type specimens as cited under type locality; Spokane County, *Suksdorf* 1205, May, 1889; Yakima, Kittitas, and Spokane counties, *Henderson* 2502, 2503, 2504, May–June, 1892; *Sandberg & Leiberg* 7, in 1893; Spokane County, *Piper* 2300, May 16, 1896.

Idaho: Lake Pend Oreille, Kootenai County, *Leiberg* 460, March–June, 1892.

Peucedanum geyeri Watson (Bibl. Index) was based on *P. ambiguum* of Hooker, which refers to Geyer's no. 458. The next year Dr. Watson published a detailed description in Proc. Am. Acad. **14**: 293, but this covers more than one species. An examination of the sheet in the Gray Herbarium shows two other species confused with it, both of which were probably collected by Spalding and seem to represent *L. gormani* and *L. farinosum*.

3. **Lomatium hendersonii** C. & R.

Peucedanum hendersonii C. & R. Bot. Gaz. **13**: 210. 1888.

Acaulescent, mostly glabrous, from a shallow constricted tuber 1 to 2.5 cm. in diameter; leaves ternate then bipinnate, ultimate segments short and obtuse; umbel equally 2 to 5-rayed, with involucels of linear acuminate scarious bractlets; rays 1 to 2 cm. long; pedicels 3 to 4 mm. long; flowers white; fruit ovate, glabrous, 5 mm. long, 4 mm.

broad, with thickish narrow wings (not half as broad as body) more or less involute, filiform or nearly obsolete dorsal and intermediate ribs, and a rather prominent ridge on the commissural face; oil tubes solitary in the intervals, 2 on the commissural side; seed face plane.

Type locality, on high hilltops, "John Day Valley," Oregon; collected by *Howell*, B in part, May, 1882; type in Herb. Coulter. Associated with the type in the original description is *Howell* 410, June, 1882, from Lost Valley.

Mountains of eastern Oregon.

Specimens examined:

OREGON: Type specimens as cited under type locality.

4. **Lomatium canbyi** C. & R.

Peucedanum canbyi C. & R. Bot. Gaz. **13**: 78. 1888.

Acaulescent, 7.5 to 20 cm. high, with a short underground stem from a thick more or less elongated rootstock which ends in a globose tuber 1 to 2.5 cm. in diameter; leaves ternate then pinnatifid, the ultimate segments small, with 3 to 5 linear-oblong lobes; umbel equally 5 to 10-rayed, with involucels of narrowly linear scarious-margined bractlets; rays 2.5 to 5 cm. long; pedicels 8 to 12 mm. long; flowers white, with purple anthers; fruit ovate-oblong, glabrous, 8 mm. long, 5 mm. broad, with wings about half as broad as body, and filiform dorsal and intermediate ribs; oil tubes solitary in the intervals (lateral intervals often with 1 or 2 accessory but shorter ones), 2 or 4 on the commissural side.

Type locality, "high ridges, E. Oregon;" collected by *Howell*, no. 67, April, 1880, and May, 1882; type in Herb. Coulter, duplicate in U. S. Nat. Herb. Associated with the type in the original description is *Cusick* 1010, in 1882 and 1884, from Union County.

Stony ground, eastern Oregon and eastern Washington and Idaho.

Specimens examined:

OREGON: Type specimens as cited under type locality; Malheur County, altitude 750 meters, *Leiberg* 2149, May 14, 1896; stony ridges, *Cusick* 1834, May 9, 1898.

WASHINGTON: Klickitat Valley, *Howell* 1367, April 26, 1889; Yakima County, *Fritillaria Club* 23, in 1890; *Whited* 56, May 4, 1896.

IDAHO: On the lower Clearwater River, Nez Perces County, *Sandberg* 150, May 10, 1892.

5. **Lomatium farinosum** (Hook.) C. & R.

Peucedanum farinosum Hook. in Lond. Jour. Bot. **6**: 235. 1847.
Ferula farinosa Geyer, in Hook. Lond. Jour. Bot. l. c.

Short caulescent; root moniliform, with 2 or 3 small rounded tubers; peduncles becoming 3 dm. high, much exceeding the leaves; leaves ternate or biternate (or the divisions sometimes 4 or 5); leaflets linear, 1 to 8 cm. long; umbel small, somewhat unequally rayed, with involucels of several linear acuminate bractlets; rays 2 to 5 cm. long; pedicels slender, 10 to 16 mm. long; flowers white; fruit linear-oblong, glabrous, 6 to 8 mm. long, 2 to 3 mm. broad, with the narrow wings less than half as broad as body; oil tubes several in the intervals.

Type locality, on wet clay "on an isolated rock in the Cœur d'Alene Mountains," Idaho; collected by *Geyer*, no. 325, April.

Eastern Washington and Idaho.

Specimens examined:

WASHINGTON: Near Spangle, Spokane County, *Suksdorf* 1204, May, 1889; *G. R. Vasey* in 1889; *Sandberg & Leiberg* 131, in 1893; Wawawai, Whitman County, *Piper* 1567, May 12, 1894; same station, *Elmer* 98, May, 1897.

IDAHO: Along Hatwai Creek, Nez Perces County, *Sandberg* 82, April 30, 1892; about Lewiston, Nez Perces County, altitude 450 to 600 meters, *A. A. & E. Gertrude Heller* 3036, May 7, 1896.

6. **Lomatium piperi** C. & R., sp. nov.

Dwarf acaulescent, from a deep-seated solitary rounded tuber with frequent clusters of fine rootlets over its surface; leaves 2 to 3-ternate; leaflets linear, usually entire, 1 to 2 cm. long; umbel 1 to 8-rayed, with involucels of few small linear bractlets or none; rays 2.5 to 5 cm. long; flowers white, the ovary with an enlarged disk projecting beyond the top; fruit almost sessile, oblong-elliptical, glabrous, 4 to 8 mm. long, 3 to 4 mm. broad, with wings half as broad as body; oil tubes small, 2 to 4 in the intervals, 4 to 6 on the commissural side; seed face plane.

Type locality, Ellensburg, Spokane County, Wash.; collected by *G. R. Vasey*, May, 1889; type in U. S. Nat. Herb.

From the mountains of northern California to Washington.

Specimens examined:

CALIFORNIA: "Northern Sierra Mountains," *Lemmon*, April–May, 1879.

OREGON: Prairies, eastern Oregon, *Howell*, April, 1880; Lookout Mountains (Sierra Blue Mountains), Crook County, *Cusick* 1687, July 1, 1897.

WASHINGTON: Hillsides, Columbia River, Klickitat County, *Suksdorf*, March–April, 1881; type specimens as cited under type locality; *Whited* 60, May 6, 1896.

L. piperi has heretofore passed as *Peucedanum farinosum*, but as Mr. C. V. Piper has pointed out to us it must be distinct. It is a great pleasure to have this opportunity of associating Mr. Piper's name with a group of plants of his own State in which he has done so much valuable work.

7. **Lomatium watsoni** C. & R.

Peucedanum watsoni C. & R. Bot. Gaz. **13**: 209. 1888.

Acaulescent, 5 to 7.5 cm. high, more or less puberulent, with a short subterranean stem from a deep-seated oblong tuber (with clusters of rootlets over its surface) with or without a thick elongated root below; leaves bipinnate, the ultimate segments short and linear-oblong; umbel unequally 1 to 5-rayed, with involucels of bractlets united nearly to the top; rays from almost wanting to 2.5 cm. long; flowers yellow; fruit sessile or nearly so, ovate, puberulent, 6 mm. long, 3 mm. broad, with very narrow wings, and filiform or almost obsolete dorsal and intermediate ribs; oil tubes (sometimes wanting) very obscure, 3 to 6 in the intervals, 1 in each rib, and 6 on the commissural side; seed face plane.

Type locality, on denuded hilltops near "Alkali," Oregon; collected by *Howell*, no. 830, May 20, 1882; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Mountains of Oregon and Washington.

Specimens examined:

OREGON: Type specimens as cited under type locality; Trout Creek, Blue Mountains, *Howell*, May 25, 1885.

WASHINGTON: Simcoe Mountains, *Howell* 180, June, 1881; mountains near Columbus, Klickitat County, *Suksdorf* 1207, April 13, 1886.

Our original description of this species included a second form which Mr. Howell well separated as *Peucedanum gormoni.*

8. **Lomatium ambiguum** (Nutt.) C. & R.

Eulophus ambiguus Nutt. Jour. Philad. Acad. **7** : 27. 1834.

Peucedanum ambiguum Nutt. in Torr. & Gray, Fl. **1** : 626. 1840.

Glabrous, from low acaulescent to 3 dm. high and caulescent, with tuberous sometimes moniliform roots; petioles much dilated at base; leaves once to twice pinnate, with more or less elongated linear leaflets, the upper often more dissected; umbel unequally 8 to 18-rayed, with no involucels; rays 2.5 to 8.5 cm. long; pedicels 4 to 8 mm. long; flowers yellow; fruit narrowly oblong, glabrous, 6 to 8 mm. long, 2 mm. broad, very narrowly winged; oil-tubes solitary in the intervals, 2 (broad and thin) on the commissural side.

Type locality, "on the borders of Flat-Head River," Oregon; collected by *Wyeth;* type in Herb. Philad. Acad.

From eastern Oregon to British Columbia, and eastward to Montana and western Wyoming.

Specimens examined:

OREGON: Type specimens as cited under type locality; *Geyer* 298; Blue Mountains, *Nevius*, in 1873 and 1874; Union County, *Cusick* 1099, May–June, 1883; *Henderson* 55, June, 1886; *Sheldon* 8308, in 1897; *Cusick* 2188, in 1898.

WASHINGTON: Hills near Spokane, *Lyall*, in 1861; eastern Washington, *G. R. Vasey* 15, in 1883; Spokane County, *Suksdorf* 319, June 19–28, 1884; *G. R. Vasey* 298, in 1889; Spokane County, *Henderson* 392, June–July, 1892; Pullman, *Piper* 1562, July 20, 1893; *Sandberg & Leiberg* 22, 44, 481, in 1893; Wenatchee, *Whited* 61, May 6, 1896; Spokane and Blue Mountains, Wallawalla County, *Piper* 2299, 2337, May–August, 1896; Blue Mountains, *Horner* 220, July 29, 1897; Pullman, Whitman County, *Elmer* 827, May, 1897.

BRITISH COLUMBIA: Yale, *Macoun*, May–July, 1889.

IDAHO: Kootenai County, *Leiberg* 551, June, 1890; Lake Pend Oreille, *Leiberg* 637, May–July, 1891; along Peter Creek (Nez Perces County) and valley of Spokane River (Kootenai County), *Sandberg* 125, 659, May–July, 1892; Clearwater River, *Henderson*, June, 1894; St. Marys River, *Leiberg* 88, June 27, 1895 Lewiston, Nez Perces County, *A. A. & E. Gertrude Heller* 2995, April 30, 1896; Priest River, *Leiberg* 2817, August 4, 1897; Salubria and Indian Valley, *Jones*, July 10–13, 1899.

MONTANA: Hellgate Canyon, *Watson* 161, August 8, 1880; head waters of Jocko River, *Canby* 151, July 15, 1883; Spanish Basin (Madison Range) and Bridger Mountains, altitude 1,800 to 2,400 meters, *Flodman* 692, 693, 694, July 10–28, 1896; Bridger Mountains, *Rydberg* 4623, June 18, 1897; Forks of Madison, *Rydberg* 4617, July 26, 1897.

WYOMING: Yellowstone Park, *Tweedy* 851, July, 1885; near Crandall Creek, northwestern Wyoming, *Rose* 274, August 29–30, 1893; Druid Peak, Yellowstone Park, *A. & E. Nelson* 5782, July 12, 1899.

9. **Lomatium leptocarpum** (Nutt.) C. & R.

Peucedanum leptocarpum Nutt. in Torr. & Gray, Fl. **1**: 626. 1840.
Peucedanum triternatum leptocarpum Torr. & Gray, l. c.
Peucedanum ambiguum leptocarpum C. & R. Rev. N. Am. Umbell. 59. 1888.

Acaulescent, becoming 3 dm. high, from deep-seated tuberous roots, glabrous; leaves ternate then pinnate, the ultimate segments linear and usually much elongated; umbels with few very unequal rays, and involucels of small linear bractlets; rays from almost wanting to 7.5 cm. long; flowers yellow; fruit nearly sessile, forming a dense cluster, linear, 9 to 10 mm. long, 2 mm. broad, with very narrow wings; oil tubes solitary in the intervals.

Type locality, "plains of the Oregon [Columbia] near the confluence of the Wahlamet;" collected by *Nuttall*, in July; type in Herb. Philad. Acad.

From Oregon and northeastern California to Colorado.

Specimens examined:

CALIFORNIA: Big Valley, Lassen County, *Baker & Nutting*, June 20, 1894.

OREGON: Type specimens as cited under type locality; *Geyer* 557; The Dalles, Wasco County, *Nevius*, in 1871; Union County, *Cusick* 359, May, 1883; Antelope, Wasco County, *Howell* 417, 557, May 10, 1885; near Grizzly Butte, Crook County, altitude 1,040 meters, *Leiberg* 299, June 19, 1894; Elgin, *V. Bailey* 59, May 27, 1896.

IDAHO: Indian Valley, *Jones*, July 15, 1899.

UTAH: Salt Lake City, altitude 1,500 meters, *Watson* 467, May, 1869.

COLORADO: Steamboat Springs, *Alice Eastwood*, July 10, 1891.

10. **Lomatium circumdatum** (Watson) C. & R.

Peucedanum circumdatum Watson, Proc. Am. Acad. **22**: 474. 1887.

Caulescent, with few branches, from a deep-seated constricted tuber, glabrous or puberulent, 3 dm. or less high; leaves ternate then once or twice pinnate; ultimate segments linear, 2 to 12 mm. long; stem leaves with petioles broadly dilated at base; umbel unequally 6 to 12-rayed, with involucels of conspicuous broadly oblanceolate (often united) bractlets, becoming scarious; rays 1 to 8.5 cm. long; pedicels 2 to 4 mm. long; flowers yellow; fruit oblong-elliptical, glabrous, 6 to 8 mm. long, 3 mm. broad, with narrow wings, and very prominent dorsal and intermediate ribs; oil tubes solitary, large, filling the intervals, 4 on the commissural side; seed face concave, with a prominent central ridge.

Type locality, "on hillsides in the Wallowa region of eastern

Oregon;" collected by *Cusick*, no. 1394, June, 1886; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Eastern Oregon and Washington, and adjacent Idaho.

Specimens examined:

Oregon: Type specimens as cited under type locality; near Harper Ranch, Malheur County, altitude 1,000 meters, *Leiberg* 2123, May 23, 1896.

Washington: Blue Mountains, *Horner* 222, June 11, 1897.

Idaho: Julietta, Hatwai Creek, and Lake Weha, *Henderson*, April–June, 1894.

In our Revision of 1888 this species was made to include a complex, and is here much more restricted. It is apt to be confused with *L. cous*, but differs in its caulescent habit, stem leaves with much inflated petioles, and glabrous fruit.

11. **Lomatium cous** (Watson) C. & R.

Peucedanum cous Watson, Proc. Am. Acad. **21**: 453. 1886.

Usually acaulescent, glabrous or slightly puberulent, with roughish scapes 5 to 15 cm. high, from a nearly globose tuber (1 to 2.5 cm. in diameter); leaves usually pinnately compound; ultimate segments short linear, entire or few-toothed or cleft; umbels unequally 3 to 10-rayed, with involucels of broadly oblanceolate scariously margined bractlets; rays from nearly wanting to 5 cm. long; pedicels 2 mm. long; flowers yellow; fruit oblong, somewhat puberulent, 6 to 8 mm. long, 3 to 4 mm. broad, with narrow wings, and prominent dorsal and intermediate ribs; oil tubes solitary, large, filling the intervals, 4 to 6 on the commissural side; seed face with central longitudinal ridge.

Type locality, "John Days Valley," eastern Oregon; collected by *Howell*, no. 270, May, 1880; type in Herb. Gray. Associated with the type in the original description are *Howell* 418 from Antelope, and *Cusick* 358 from Union County.

Eastern Oregon and Washington, and adjacent Idaho.

Specimens examined:

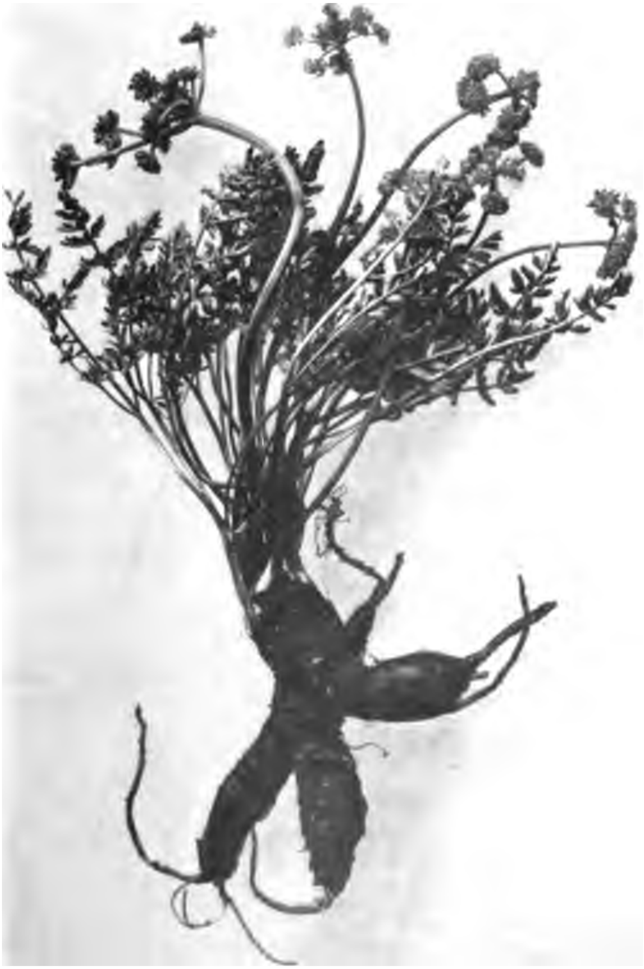
Oregon: Sterile stony ridges, Union County, altitude 900 to 1,200 meters, *Cusick* 358, in 1884; Barren Valley, Malheur County, altitude 1,275 meters, *Leiberg* 2199, June 2, 1896; *Cusick* 1837, April 19, 1898.

Washington: Wawawai, Whitman County, *Elmer* 97, May, 1897.

Idaho: Lower Clearwater River, Nez Perces County, *Sandberg* 21, April 24, 1892; about Lewiston, Nez Perces County, altitude 450 to 600 meters, *A. A. & E. Gertrude Heller* 3052, May 12, 1896.

12. **Lomatium montanum** C. & R., sp. nov. PLATE IX.

Acaulescent, from a slender or somewhat enlarged and elongated rootstock, glabrous except the slightly puberulent inflorescence, 5 to 20 cm. high; leaves usually twice pinnate, the leaflets short-oblong, obtuse, much crowded; umbel unequally 3 to 8-rayed, with involucels of distinct obovate more or less purplish bractlets; rays 4 to 30 mm. long; pedicels 2 to 4 mm. long; flowers yellow; fruit oblong, glabrous, 5 to 6 mm. long, 2 to 3 mm. broad, with wings about half as broad as body; oil tubes several in the intervals.



Lomatium montanum C. & R., sp. nov.

Type locality, mountain ridges in Yellowstone National Park; collected by *Rose*, no. 479, August 19, 1893; type in U. S. Nat. Herb.

On high ridges, from the mountains of eastern Oregon to Wyoming and western Dakotas.

Specimens examined:

Oregon: Higher Wallowa Mountains, *Cusick* 2095*a*, August 23, 1898.

Idaho: Dry basaltic hillsides, Lewiston, Nez Perces County, *Piper* 2019, May 11, 1895.

Montana: Altitude 1,800 to 2,400 meters, *Tweedy*, June, 1888; Grafton, *Williams* 149, June 2, 1892; near Red Lodge, *Rose* 58, July 29, 1893; Little Belt Mountains, near the Pass, altitude 2,100 meters, *Flodman* 696, August, 1896; Bridger Mountains, *Rydberg* 4620, 4624, 4625*a*, 4627, June 14–15, 1897; same station, *Chesnut & Jones* 182, in 1900; near Bozeman, *Chesnut & Jones* 232, 233, in 1900.

Wyoming: Yellowstone Park, *Letterman*, August, 1885; same station, *Tweedy*, in 1885; type specimens as cited under type locality; same station, *Rose* 198, August 14, 1893; northwestern Wyoming, *Rose* 391, 531, 532, August 26–31, 1893; headwaters of Tongue River, Big Horn Mountains, *Tweedy* 57, July, 1898.

North Dakota: Little Missouri River, *Canby* 152*a*, June 30, 1883.

Explanation of Plate IX.—Photograph of plant taken in the field, furnished by Victor K. Chesnut.

This species has been confused chiefly with *L. cous*, sometimes with *L. circumdatum*, but differs from both in its foliage, rootstock, oil tubes, smaller fruit, etc., and has a much more eastern and high mountain range.

13. **Lomatium utriculatum** (Nutt.) C. & R.

Peucedanum utriculatum Nutt. in Torr. & Gray, Fl. **1** : 628. 1840.

Caulescent or sometimes nearly acaulescent, from cespitose to 3 dm. or more high, from a more or less thickened root, puberulent or glabrous; petioles very broadly dilated; leaves ternately or pinnately decompound, with ultimate segments narrowly linear, 12 mm. or less long; umbel unequally 5 to 20-rayed, with involucels of much dilated mostly obovate often toothed petiolate bractlets; rays 5 cm. or less long; pedicels 4 to 10 mm. long; flowers yellow; fruit broadly elliptical, glabrous, 4 to 10 mm. long, 2 to 7 mm. broad, with wings nearly as broad as body, and prominent dorsal and intermediate ribs; oil tubes large and solitary in the intervals, 4 to 6 on the commissural side, sometimes 2 or 3 very short accessory ones in the dorsal intervals; seed face somewhat concave.

Type locality, "rocky plains, particularly near the confluence of the Wahlamet and Oregon [Columbia] rivers," Oregon; collected by *Nuttall;* type in Herb. Philad. Acad., duplicate in Herb. Gray.

From southern California to British Columbia.

Specimens examined:

California: *Bigelow*, in 1853–54; Fort Tejon, *Xantus de Vesey* 39, in 1857–58; Mount Diablo, *Brewer* 1128, May 20, 1862; Newcastle, Placer County, *Bolander* 4578, April, 1865; near San Francisco, *Kellogg*, in 1866; same station, *Kellogg & Harford* 1154, 1155, in 1868–69; Sonoma County, *Samuels* 93; *Bridges* 131*a*;

Plumas County, *Mrs. Austin* 57; Folsom, Sacramento County, *K. Curran;* Snow Mountain, Lake County, *Brandegee;* San Bernardino, *G. R. Vasey*, May, 1880; San Jacinto, *Jones* 3172, April 25, 1882; Sierra County, *Lemmon*, June, 1883; San Luis Obispo, *Mrs. R. W. Summers* 355, April 25, 1886; Los Angeles County, *Parish* 1944, June, 1887; Tehachapi, Kern County, *Brandegee* 21, May, 1889; Los Angeles, *Hasse*, April–May, 1892; Delano (Kern County), Bakersfield (Kern County), Alcalde (Fresno County), *Alice Eastwood*, April 5–May 9, 1893; Mount Hamilton, *Rutter* 54, April 11, 1895; Amador County, *Hansen* 1297, March–May, 1896.

OREGON: Type specimens as cited under type locality; Silverton, Marion County, *Hall* 212, in 1871; western Oregon, *Howell*, June, 1880; *Leiberg* 4106, in 1899.

WASHINGTON: Steilacoom, Pierce County, *Lt. Mullen's Exp.;* prairies of Walla Walla, *Wilkes Exped.* 359; *Cooper;* Steilacoom, *Piper* 635, May 27, 1888; Woodlawn, Thurston County, *Henderson* 395, June 20, 1892.

BRITISH COLUMBIA: Oak Bay, Vancouver Island, *Macoun*, May 31, 1887.

14. **Lomatium vaseyi** C. & R.

Peucedanum vaseyi C. & R. Bot. Gaz. **13** : 144. 1888.

Short caulescent, 15 to 20 cm. high, slightly pubescent; petioles wholly inflated; leaves small (2.5 to 5 cm. long), bipinnate, with the small ovate segments irregularly 3 to 5-lobed; umbel equally 2 to 5-rayed, with involucels of obovate petiolulate toothed bractlets; rays 2.5 cm. long; pedicels 2 to 4 mm. long; flowers yellow; fruit broadly oblong, emarginate, glabrous, 12 to 14 mm. long, 8 mm. broad, with wings twice as broad as body, and mostly prominent dorsal and intermediate ribs; oil tubes solitary in the intervals, 4 on the commissural side.

Type locality, "San Bernardino Mountains, California;" collected by *G. R. Vasey*, no. 231, May, 1880; type in U. S. Nat. Herb., duplicate in Herb. Coulter.

On the mesas of southern California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; San Bernardino County, *Parish* 2060, April 10, 1888; Darwin Mesa, Inyo County, altitude 1,800 meters, *Coville & Funston* 789, May 20, 1891; dry clay mesas near Colton, San Bernardino County, *Parish* 2157, April–May, 1891.

15. **Lomatium caruifolium** (Hook. & Arn.) C. & R.

Ferula caruifolia Hook. & Arn. Bot. Beechey 348. 1840.
Peucedanum caruifolium Torr. & Gray, Fl. **1** : 628. 1840.
Peucedanum erosum Jepson, Erythea **5** : 1. 1897.

Like *L. utriculatum*, but often more caulescent, puberulent or glabrous, the elongated peduncles 1.5 to 4.5 cm. high; leaf segments 1 to 5 cm. long; bractlets of involucels obovate and occasionally toothed; fruit 6 to 8 mm. long, with wings half as broad as body, and obsolete dorsal and intermediate ribs; oil tubes indistinct, 2 or 3 in the intervals, none on the commissural side.

Type locality, in California; collected by *Douglas;* duplicate type in Herb. Gray.

Central California, chiefly in the Bay Region.

Specimens examined:

CALIFORNIA: *Bigelow*, in 1853–54; *Douglas;* Walnut Creek, Contra Costa County, *Brewer* 1014, April 30, 1862; Sonoma County, *Samuels* 92; *Bridges* 131; Little Oak, Solano County, *Jepson*, May 2–6, 1891; Exeter, Tulare County, *Alice Eastwood*, April 26, 1895.

16. **Lomatium ellipticum** (Torr. & Gray) C. & R.

Peucedanum nudicaule ellipticum Torr. & Gray, Pacif. R. Rep. **2**^{1}: 121. 1855.

Caulescent, branching at base, 3 to 4 dm. high, more or less pubescent, from a large root; leaves ternate then once or twice pinnate; the ultimate segments linear-oblong, short, cuspidate; umbel 5 to 12-rayed, with involucels of conspicuous bractlets, as in *L. macrocarpum;* rays 3 to 5 cm. long; pedicels 2 to 6 mm. long; flowers white(?); fruit broadly and bluntly elliptical, glabrous, 16 to 18 mm. long, about 10 mm. broad, with wings 4 mm. broad (broader than body), and rather obscure dorsal and intermediate ribs; oil tubes solitary in the intervals.

Type locality, "Round Valley, near the sources of the Sacramento, in the Sierra Nevada," California; collected by *Snyder* in 1854; type in Herb. Gray.

Central California, in the region of the head waters of the Sacramento.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; Feather River, near Marysville, Yuba County, *Bigelow*, in 1853–54.

17. **Lomatium macrocarpum** (Nutt.) C. & R.

Peucedanum macrocarpum Nutt. in Torr. & Gray, Fl. **1** : 627. 1840.
Peucedanum macrocarpum eurycarpum Gray, Proc. Am. Acad. **8** : 385. 1872.
Peucedanum eurycarpum C. & R. Rev. N. Am. Umbell. 61. 1888.

Somewhat caulescent or nearly acaulescent, 1 to 6 dm. high, more or less pubescent, much branched at base, from a more or less elongated thick root; leaves pinnately (or first division ternate) compound; segments pinnately incised, ultimate divisions ovate or short linear; umbel somewhat equally 3 to 10-rayed, with involucels of conspicuous somewhat foliaceous lanceolate or linear bractlets often united and unilateral; rays 2 to 10 cm. long; pedicels 2 to 10 mm. long; flowers white; calyx-teeth evident; fruit linear-oblong to broadly oblong, elliptical or ovate, glabrous, 6 to 20 mm. long, 3 to 7 mm. broad, with wings from very narrow to as broad as body, and filiform dorsal and intermediate ribs; oil tubes solitary in the intervals (often obscure, rarely 2 or 3), 2 or 4 on the commissural side; seed face with a slight central longitudinal ridge.

Type locality, "Barren hills on the Oregon [Columbia];" collected by *Nuttall;* type in Herb. Philad. Acad. A duplicate type of *Peucedanum macrocarpum eurycarpum* Gray (*Hall* 21 from Oregon) is in Herb. Philad. Acad.

From central California through eastern Oregon and Washington to British America, eastward to western Colorado and western Wyoming.

Specimens examined:

California: Santa Clara Valley, *Peckham*, May 4, 1866; Plumas County, *Mary E. P. Ames*, in 1872; Sonoma County, *Samuels* 94; Siskiyou, Plumas, and Sierra counties, *Lemmon*, in 1889; Amador County, *Hansen* 333, May 29, 1895; Santa Clara County, *Jepson*, June 9, 1896; Sisson, Siskiyou County, *Brown*, in 1897.

Oregon: *Hall* 21, in 1871 (type of *Peucedanum macrocarpum eurycarpum* Gray); eastern Oregon, *Howell*, in 1880; *Cusick* 37, May, 1883; near Eugene City, Lane County, *Howell* 737, June 28, 1893; Malheur Butte, Malheur County, *Leiberg* 2038, May 12, 1896; Swan Lake Valley, Klamath County, *Applegate* 231, May 24, 1896; *Cusick* 1840, April 25, 1898.

Washington: W. Klickitat County, *Suksdorf*, May–June, 1883; eastern Washington, *G. R. Vasey*, in 1883; Spokane County, *Suksdorf*, June 20, 1884; *G. R. Vasey* 308, in 1889; Yakima, Franklin, and Whitman counties, *Henderson*, May–July, 1892; *Sandberg & Leiberg* 61, 243, in 1893; Pullman, Whitman County, *Piper* 1563, June 24, 1894; Cleveland, Klickitat County, *Ely*, May, 1895; *Sheldon* 8038, in 1897; Waitsburg, Wallawalla County, *Horner* 221, June 5, 1897; Pullman, Whitman County, *Elmer* 96, May, 1897.

Idaho: Lower Clearwater River, Nez Perces County, *Sandberg* 52, April 26, 1892; hills near Moscow, *Henderson*, April–July, 1894; Cœur d'Alene Mountains, *Leiberg* 13, June 22, 1895; near Lewiston, Nez Perces County, *A. A. & E. Gertrude Heller* 2970, April 27, 1896.

Nevada: Near Virginia City, *Bloomer*, February 14, 1864; Trinity and W. Humboldt Mountains, *Watson* 468, May–June, 1868; Palisade, *Jones* 3883, June 14, 1882; Aurum, *Jones*, June, 1891.

Colorado: Egeria Park, Routt County, *Alice Eastwood*, July 5, 1891.

Wyoming: Yellowstone Park, *Tweedy*, June, 1885; La Barge, Uinta County, *Stevenson*, May–June, 1894; Point of Rocks, Sweetwater County, *Nelson* 3086, June 1, 1897; Yellowstone River, Yellowstone Park, *A. & E. Nelson* 5733, July 9, 1899.

Montana: Columbia Falls, *Williams* 148, June–July, 1894.

British Columbia: Spences Bridge, *Macoun*, May 25, 1889.

Assiniboia: Medicine Hat, *Macoun* 4964, June 1, 1894; Farewell Creek, Cypress Hills, *Macoun* 10694, June 27, 1895; Wood Mountain Post, *Macoun* 10696, July 10, 1895.

Alberta: Milk River Bridge, *Macoun* 10693, July 19, 1895.

This abundant and widely distributed species is very constant in its general habit, pubescence, foliage, and striking involucels, but wonderfully variable in its fruit. We have attempted in vain to discover lines of cleavage for segregates, not even different geographical distribution supporting diverse fruit characters. In some forms the linear-oblong fruit is 20 mm. long, but 3 mm. broad, and with very narrow wings; while at the other extreme are small oblong or ovate fruits but 6 mm. long, nearly as broad, and with wings as broad as body. Between the two extremes, however, there seems to be every possible gradation.

18. **Lomatium dasycarpum** (Torr. & Gray) C. & R.

Peucedanum dasycarpum Torr. & Gray, Fl. **1**: 628. 1840.
Peucedanum pringlei C. & R. Bot. Gaz. **13**: 209. 1888.

Very short caulescent or acaulescent, with several stout peduncles 1.5 to 3 cm. high from a common root, tomentose pubescent; leaves rather small, pinnately decompound, with numerous short linear segments; umbel somewhat equally 6 to 15-rayed, with involucels of linear to ovate more or less tomentose bractlets; rays 2.5 to 7.5 cm. long; pedicels 6 to 10 mm. long; flowers white; fruit nearly orbicular, coarsely pubescent (sometimes becoming almost glabrous), 8 to 14 mm. long, 7 to 12 mm. broad, with thin membranous wings broader than the body, and filiform dorsal and intermediate ribs; oil tubes large and solitary in the intervals (an occasional secondary one in the lateral intervals), 4 on the commissural side; seed deeply sulcate beneath the oil tubes, with plane face.

Type locality, "California;" collected by *Douglas;* type in Herb. Gray.

Southern California.

Specimens examined:

California: *Bigelow*, in 1853–54; type specimen as cited under type locality; Angel Island, *G. R. Vasey*, in 1875; Cuyamaca Mountains, *G. R. Vasey* 230, May, 1880; San Luis Obispo County, *Mrs. Summers* 356, April 25, 1882; San Diego County, *Pringle*, May 4, 1882; San Diego, *Jones* 3088, March 20, 1882; Santa Ysabel, San Diego County, *Henshaw*, April 8–24, 1893; Los Angeles County, *Hasse*, May 21 1893; Saugus, Los Angeles County, *Canby*, in 1894; near San Diego, *Rutter* 53, April 11, 1895; Cuyamaca Mountains, altitude 1,380 meters, *Parish* 4419, June 5–7, 1897.

19. **Lomatium tomentosum** (Benth.) C. & R.

Peucedanum tomentosum Benth. Pl. Hartw. 312. 1849.

More or less densely villous-tomentose, somewhat caulescent or scarcely so, about 3 dm. high; leaves finely dissected into narrow or filiform segments; umbel with 4 to 8 equal rays, and involucels of linear to lanceolate or ovate acuminate bractlets; rays (fertile) 2.5 to 7.5 cm. long; pedicels 6 to 12 mm. long; flowers white; calyx teeth evident; fruit ovate to orbicular, densely tomentose, 10 to 18 mm. long, 6 to 10 mm. broad, with thickish wings from not quite as broad as body to broader, and prominent dorsal and intermediate ribs (concealed by the tomentum); oil tubes mostly 3 in the intervals, 4 on the commissural side; seed face somewhat concave.

Type locality, "in amnibus exsiccatis fluviorum vallis, Sacramento," Cal., collected by *Hartweg*, no. 257 (but sent out as no. 1751), in 1846–47; type in Herb. Kew, duplicate in Herb. Gray.

California, from the bay region to Siskiyou County.

Specimens examined:

California: San Luis Obispo, *Brewer* 461, April, 1861; Ukiah, Mendocino County, *Bolander* 3967, in 1864; Sausalito, Marin County, *Kellogg & Harford* 1156, May 20, 1868; Chico, Butte County, *Mrs. R. M. Austin*, May, 1883; Contra Costa County, *Greene*, May, 1889; Little Chico Creek, Butte County, *Mrs. R. M. Austin* 269, May, 1896; Sisson, Siskiyou County, *Brown*, in 1897; Mission Hills, San Francisco, *Alice Eastwood*, May 20, 1898.

20. **Lomatium orientale** C. & R., sp. nov.

Peucedanum nudicaule Nutt. in great part, and of all later authors.

Acaulescent or shortly caulescent, with short and soft pubescence, peduncles 1 to 3 cm. high, and a thick elongated root (often swollen in places); leaves bipinnate, the small oblong segments entire or toothed; umbel unequally 5 to 8-rayed, with involucels of scarious-margined (often purplish) lanceolate distinct bractlets; rays 1 to 3.5 cm. long; pedicels glabrous, 5 to 7 mm. long; flowers white or pinkish, with glabrous ovaries; fruit almost round, emarginate at base, glabrous, 5 mm. long, 4 mm. broad, with wings not as broad as body, and indistinct or obsolete dorsal and intermediate ribs; oil tubes solitary in the intervals (rarely 2 in the lateral intervals), 4 on the commissural side; seed face plane.

Type locality, plains around Denver, Colo.; collected by *Bethel*, May, 1895; type in U. S. Nat. Herb.

On the plains from North Dakota to Kansas, and west to Arizona and Washington.

Specimens examined:

KANSAS: Western Kansas, *Herb. State Agric. Coll.*

NEBRASKA: *Wilcox*, in 1887; Long Pine, Brown County, *Rutter*, June 1, 1893.

SOUTH DAKOTA: Aurora County, *Wilcox*, May 20, 1892.

MONTANA: *Blankinship*, May 3–4, 1890; Warm Peak, Bear Lodge, *V. Bailey*, June 8, 1894.

WYOMING: Fort Russell, *Ruby*, in 1885; Cheyenne, *Havard*, in 1893; Laramie plains, *Nelson*, May, 1893 and 1894.

COLORADO: *Hall & Harbour* 212, in 1862; Palmer Lake, *Alice Eastwood*, May 25, 1890; Cache la Poudre, *Cowen*, May 23, 1891; foothills, altitude 1,800 to 1,950 meters, *Crandall*, May, 1893 and 1894; near Windsor, *Osterhout*, May, 1894; plains about Denver, *Bethel*, May, 1895; Log Canyon and Rist Canyon, *Holzinger* 3, May 31, 1896.

NEW MEXICO: Mangus Springs, *Rusby* 148, February 25, 1880.

ARIZONA: *MacDougal* 5, June, 1891; Flagstaff, altitude 1,650 meters, *MacDougal* 5, May 31, 1898; Clifton, *Davidson*, in 1899.

UTAH: *Palmer* 181, in 1877.

IDAHO: *Allen*, in 1873; boundary of Idaho and Washington, *Canby*, in 1891.

In 1818 Nuttall transferred Pursh's *Smyrnium nudicaule* to *Ferula*, and cited with the type of Pursh (a *Lewis & Clark* plant from the Columbia River) a more eastern plant, "on the high plains of the Missouri, commencing about the confluence of the river Jauk [Jaune=Yellowstone or Jacque=Dakota]," a plant said by Nuttall to be associated on the eastern plains with *L. foeniculaceum*. Since then the name *nudicaulis* has been associated with the plant of the eastern plains. It was a puzzle to us to find that the type locality of *Smyrnium nudicaule* was entirely to the west of its present range, but Messrs. Robinson and Greenman have cleared up the matter by examining Pursh's type, and discovering that it is the same as the abundant *Seseli leiocarpum* of Hooker, from the same region. This leaves the eastern plant without a name.

21. **Lomatium nevadense** (Watson) C. & R. FIG. 60.

Peucedanum nevadense Watson, Proc. Am. Acad. **11**: 143. 1876.

Glaucous, puberulent, short caulescent, peduncles 1 to 4 dm. high; leaves pinnately decompound, with small segments; umbel unequally

5 to 10-rayed, with involucels of scarious-margined linear-lanceolate bractlets sometimes toothed and usually distinct; rays 1 to 5 cm. long; pedicels pubescent, 4 to 10 mm. long; flowers white, with pubescent ovaries; fruit round to ovate, somewhat pubescent, 6 to 10 mm. long, 4 to 8 mm. broad, with wings almost as broad as body, and evident dorsal and intermediate ribs; oil tubes 3 or 4 in the intervals, 4 to 6 on the commissural side.

Type locality, Unionville, Nevada, altitude 1,500 meters; collected by *Watson*, no. 469, June, 1868; type in U. S. Nat. Herb.

From the mountains of southeastern Oregon and eastern California to Nevada and Arizona.

Specimens examined:

OREGON: Near Button Springs, Lake County, altitude 1,470 meters, *Leiberg* 361, June 30, 1894; near Harpers Ranch, Malheur Divide, altitude 240 to 570 meters, *Leiberg* 2107, 2145, 2205, May 22–June 5, 1896.

CALIFORNIA: "Upper Sacramento," *Parkinson;* Sierra Nevada, *Lemmon*, in 1875; near Truckee, Nevada County, *Sonne*, May–July, 1886, 1887, and 1895.

NEVADA: Near Virginia City, *Bloomer*, March–April, 1863–64; type specimens as cited under type locality; Carson City, altitude 1,500 meters, *Watson* 469, April, 1868; Empire city, Ormsby County, *Jones* 3879, 3880, May 23–June 19, 1882; Reno and Verdi, Washoe County, *Sonne*, June, 1890; same station, *Hillman* in 1890.

UTAH: Silver Reef, altitude 1,350 meters, *Jones* 5163, May 4, 1894.

ARIZONA: Peach Springs, Mohave County, *Lemmon* 125, May, 1884; Tucson Mountains, *Toumey* 191, April 8, 1892; near Pagumpa, altitude 1,200 meters, *Jones* 5099, April 23, 1894.

Formerly confused with *L. nudicaule*, from which it may be readily distinguished by its pubescent pedicels, ovaries, and fruit, all of which are glabrous in *L. nudicaule*. Also the range of *L. nevadense* is farther west, in the Sierra Nevada region, while *L. nudicaule* belongs more especially to the plains and more eastern foothills.

Lomatium nevadense cupulatum (Jones) C. & R.

Peucedanum nevadense cupulatum Jones, Contr. to Western Botany no. 8: 29. 1898.

Involucels of bractlets united into a cup with hyaline margin, 6 to 8 mm. long; oil tubes 8 or 9 on the commissural side.

Type locality, gravelly mesas, "Reno, Nevada," altitude 1,500 meters; collected by *Jones*, June 19, 1882, and April 22, 1897; type in Herb. Jones.

Only known from the type locality.

Specimens examined:

NEVADA: Type locality, *Sonne* 3, June, 1890.

22. **Lomatium daucifolium** (Nutt.) C. & R.

Peucedanum daucifolium Nutt. in Torr. & Gray, Fl. 1: 627. 1840.
Peucedanum foeniculaceum daucifolium Torr. & Gray, l. c.
Peucedanum villosum Nutt. in Bot. King Surv. 131. 1871, in part.
Peucedanum foeniculaceum of later authors, not Nutt.

At first very tomentose, becoming more or less glabrate, with peduncles 1 to 2 dm. long; leaves very finely dissected, ternate then pinnately decompound into short filiform segments; umbel rather unequally 3 to 12-rayed, with gamophyllous involucels, 5 to 7-cleft, and with conspicuously hairy margins; rays 2.5 to 7.5 cm. long; pedicels 6 to 10 mm. long; flowers yellow, the ovary glabrous; fruit broadly oblong, glabrous, 5 to 8 mm. long, 4 mm. broad, with wings half as broad as body, and prominent dorsal and intermediate ribs; oil tubes 1 to 3 in the intervals, 2 to 4 on the commissural side.

Type locality, "on the Platte," near Independence, Jackson County, Mo.; collected by *Nuttall;* type in Herb. Philad. Acad.

On the plains, from Nebraska, through Kansas and Missouri, to eastern Texas; perhaps with more northern extension.

Specimens examined:

Nebraska: Wymore, Gage County, *Williams* 132, May 25, 1888.

Kansas: Miami County, *Oyster*, April, 1883; Manhattan, *Bassler*, May 4, 1889; Onaga, *Crevecœur*, June, 1892 and 1893; Osborne County, *Shear* 40, May 19, 1894.

Missouri: Type specimens as cited under type locality; Jackson County, *Bush* 322, 543, April–May, 1894 and 1896.

Indian Territory: Limestone Gap, *Butler*, April, 1876.

Oklahoma: Huntsville, Kingfisher County, *Laura Blankinship*, April 16–31, 1896.

Texas: Dallas, *Woolson* 91, in 1873; same station, *Reverchon* 361, March–April, 1881.

23. **Lomatium foeniculaceum** (Nutt.) C. & R.

Ferula foeniculacea, Nutt. Gen. **1** : 183. 1818.
Lomatium villosum Raf. Jour. Phys. **89** : 101. 1819.
Cogswellia villosa Spreng. in Roem. & Schult. Syst. **6** : 588. 1820.
Peucedanum foeniculaceum Nutt. in Torr. & Gray, Fl. **1** : 627. 1840.

Acaulescent, at first densely villous but becoming more or less glabrate, 1 to 3 dm. high; leaves finely dissected, ternate then pinnately decompound, with very numerous narrow crowded segments; umbel somewhat equally 5 to 15-rayed, with involucels of conspicuous lanceolate more or less united and usually very tomentose bractlets; rays 2 to 4 cm. long; pedicels 2 to 6 mm. long; flowers yellow, the ovaries densely pubescent; fruit orbicular to oblong, somewhat pubescent, 5 to 8 mm. long, 4 to 5 mm. broad, with wings half as broad as body; oil tubes 3 or 4 in the intervals, 4 on the commissural side; seed face plane.

Type locality, "on the high plains of the Missouri, commencing about the confluence of the river Jauke [Yellowstone?];" collected by *Nuttall;* type not in Herb. Philad. Acad., and possibly lost.

From the plains of Assiniboia to Texas.

Specimens examined:

Assiniboia: Medicine Hat and Cypress Hills, *Macoun* 5002, 5003, May–June, 1894.

Wyoming: Sheridan County, *Tweedy* 2427, July, 1899.

North Dakota: "Bad Lands," Little Missouri, *Canby* 150, June 30, 1883; Fort Buford, *Havard*, May, 1889.

South Dakota: Black Hills, near Fort Meade, *Forwood* 145, May 6, 1887; Black Hills, Hot Springs, *Rydberg* 728, June 15, 1892; Alkali Creek, *V. Bailey* 18, June 3, 1894.

Nebraska: "Plains of the Platte," *Nuttall* (type of Nuttall's *Peucedanum villosum*).

Kansas: Onaga, *Crevecœur*, June 5, 1893.

Texas: Eagle Pass, *Havard.*

24. **Lomatium vaginatum** C. & R., sp. nov.

Short, caulescent, from an elongated more or less thickened root, 3 to 4 dm. high, often spreading from the base, somewhat scabrous throughout; leaves rather broad, ternate then once to twice pinnate, ultimate segments short and obtuse, often more or less confluent; petioles a large inflated purple sheath; umbels somewhat unequal, 5 to 12-rayed, with a single involucral bract, and involucels of numerous linear elongated acuminate bractlets; rays 2 to 6 cm. long; pedicels 4 to 7 mm. long; flowers pale yellow; fruit broadly oblong, somewhat scabrous, 8 to 10 mm. long, with wings nearly as broad as body; oil tubes large, 2 or 3 in the intervals.

'Type locality, Logan Valley, Union County, Oreg.; collected by *W. C. Cusick*, no. 1697; type in U. S. Nat. Herb.

Eastern Oregon.

Specimens examined:

Oregon: Type specimens as cited under type locality; near Grizzly Butte, Crook County, altitude 1,425 meters, *Leiberg* 234, June 14, 1894; Malheur Divide, *Leiberg* 2160, May 30, 1896; near Beulah, Malheur County, *Leiberg* 2293, June 17, 1896.

California: Yreka, Siskiyou County, *Greene* 788, May 15, 1876.

Mr. Cusick has distributed this species as *Peucedanum donnellii*, but the fruit wings are broader than in that species.

25. **Lomatium marginatum** (Benth.) C. & R.

Peucedanum marginatum Benth. Pl. Hartw. 312. 1849.

Tall (at least 3 dm. high) and somewhat caulescent, glabrous; leaves large, much compounded into long linear segments; fruiting rays few, much elongated, 5 cm. long; pedicels slender, 10 to 12 mm. long; involucral bracts linear, elongated, acuminate, somewhat scarious margined; fruit immature, elliptical oblong, glabrous.

Type locality, "in valle Sacramento;" collected by *Hartweg*, no. 1752, duplicate in Herb. Gray.

Central California.

Specimens examined:

California: Type specimens as cited under type locality.

Brewer's no. 4536 (1865), from the banks of the American River, California, must be very near this species. The only striking difference is the much smaller bractlets.

In the Botany of California *Peucedanum marginatum* is referred to *P. caruifolium*, where it has ever since remained. A careful comparison of the Douglas plant, which is the type of the former, and the Hartweg plant, which is the type of the latter, convinces us that the two are very distinct. *P. marginatum* is a much stronger plant, with very different bractlets, longer pedicels, and doubtless larger fruit, etc. No material, however, has been seen except that of Hartweg's collection, made more than fifty years ago. The attention of Californian botanists is called to the desirability of collecting a full series of this species.

26. **Lomatium oreganum** C. & R.

Peucedanum oreganum C. & R. Rev. N. Am. Umbell. 64. 1888.

A very much reduced cespitose plant from a multicipital caudex, pubescent throughout; leaves narrow in outline, once to twice pinnate, alternate segments short, ovate to linear-ovate, apiculate; peduncles slender and weak, longer than the leaves, 2.5 to 10 cm. long; umbels simple, or of two small umbellets (one sessile), with involucels of linear green bractlets; pedicels of sterile flowers 2 to 3 mm. long, fruiting pedicels fewer and shorter; fruit 3 to 4 mm. long, broadly oblong, pubescent, with narrow wings; calyx teeth present.

Type locality, "Alpine rocks, Blue and Eagle Creek Mountains," Oregon; collected by *W. C. Cusick*, no. 1390, August, 1886–1888; type in Herb. Coulter, fragments in U. S. Nat. Herb.

Specimens examined:

OREGON: Type specimens as cited under type locality; also cliffs of Blue Mountains, head of Anthonys Creek (said by *Cusick* to be the exact locality of the type specimens), altitude 2,400 meters, *Cusick* 2217, July 19–September 14, 1899.

27. **Lomatium hallii** (Watson) C. & R.

Peucedanum hallii Watson, Proc. Am. Acad. **11**: 141. 1876.

Short caulescent, with elongated peduncles 1.5 to 4 dm. high, glabrous; leaves pinnate, oblong in outline, the ovate segments about 1 cm. long, deeply toothed or pinnatifid; umbel equally 3 to 6-rayed, with involucels of small bractlets; rays about 2.5 cm. long; pedicels 6 to 8 mm. long; flowers yellow; fruit broadly elliptical, glabrous, 6 mm. long, 4 mm. broad, with filiform dorsal and intermediate ribs; oil tubes 3 in the intervals, 4 to 6 on the commissural side.

Type locality, "northern Oregon;" collected by *Hall*, no. 211; type in Herb. Gray.

Alpine in northern Oregon and Washington.

Specimens examined:

OREGON: Mount Hood, about timber line, *Howell* 738, August 9, 1893.

28. **Lomatium leibergi** C. & R., sp. nov.

Very short caulescent, glabrous throughout, from a caudex which becomes large and multicipital; peduncles 2 to 3 dm. high, exceeding the leaves; leaves bright green, narrow in outline, 1 to 1.5 dm. long, bipinnate; pinnae 6 or 7 pairs, ovate to oblong, lowest pair somewhat elongated; ultimate divisions small, ovate, pinnately lobed or toothed; umbel rather equally few-rayed, with involucels of linear elongated distinct bractlets; rays 12 to 18 mm. long; pedicels 2 to 4 mm. long; flowers deep yellow; fruit (immature) narrowly oblong, 5 mm. long, with narrow wings.

Type locality, Oregon; collected by *Leiberg*, no. 4166, in 1899; type in U. S. Nat. Herb.

Only known from type locality.

Specimens examined:

OREGON: Type specimens as cited under type locality.

29. Lomatium martindalei C. & R.

Peucedanum martindalei C. & R. Bot. Gaz. **13**: 142. 1888.

Resembling *L. hallii* in habit and foliage, but differing in leaves, sometimes bipinnate, with toothed or pinnatifid segments; fruit 8 to 16 mm. long, 7 mm. broad, with wings much broader than body (which is but 2 mm.), and prominent dorsal and intermediate ribs; oil tubes solitary in the intervals, 2 on the commissural side; seed face somewhat concave, with central longitudinal ridge.

Type locality, "rocky places, Cascade Mountains, Oregon;" collected by *Howell*, May–June, 1880; type in Herb. Coulter.

Mountains of Oregon.

Specimens examined:

OREGON: Near Corral Spring, Klamath County, altitude 1,630 meters, *Leiberg* 609, August 2, 1894; Crater Lake, altitude 1,900 to 2,200 meters, *Coville & Leiberg* 369, 382, 387, August 13–14, 1896; same station, altitude 2,400 meters, *Gorman* 479, 480, August 20–21, 1896.

Lomatium martindalei angustatum C. & R.

Peucedanum martindalei angustatum C. & R. Bot. Gaz. **13**: 143. 1888.

Usually more caulescent and sometimes taller, with more dissected leaves, and wings of fruit but 1 mm. wide, making a fruit 4 mm. wide.

Type locality, rocky places, "Cascade Mountains," Oregon; collected by *Howell*, in 1880; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Mountains of Oregon, Washington, and British Columbia.

Specimens examined:

OREGON: Type specimens as cited under type locality; at timber line on Mount Hood, altitude 1,800 to 2,100 meters, *Merriam*, in 1896; Mount Jefferson, altitude 1,800 meters, *Coville & Applegate* 1171, August 25, 1898.

WASHINGTON: Near Ellensburg, Kittitas County, *G. R. Vasey* 392, August, 1889; Olympia Mountains, *Piper* 879, September 30, 1890; Skamania County, *Suksdorf* 2112, May–August, 1892; Cascade Mountains (altitude 990 meters) and Mount Adams (altitude 1,800 meters), *Henderson* 2514, 2575, July–August, 1892; *Sandberg & Leiberg* 745, in 1893; Mount Rainier, altitude 2,100 meters, *Piper* 2008, August, 1895; Goat Mountains (Cascades), altitude 1,500 meters, *Allen* 258, in 1896.

BRITISH COLUMBIA: Mount Mark, Vancouver Island, altitude 900 meters, *Macoun*, July 25, 1887.

Perhaps too near *Lomatium hallii*, but no intergrades have yet been found.

30. Lomatium laevigatum (Nutt.) C. & R.

Peucedanum laevigatum Nutt. in Torr. & Gray, Fl. **1**: 627. 1840.

Resembling *L. triternatum*, but completely glabrous, about 3 dm.

high, with triternate leaves and much reduced leaflets or segments, the latter but 6 to 18 mm. long and 1 mm. wide; pedicels 8 to 10 mm. long; fruit 8 to 10 mm. long, 3 to 4 mm. broad, with wings as broad as body.

Type locality, "Blue Mountains of Oregon;" collected by *Nuttall;* type in Herb. Philad. Acad.

Along the Upper Columbia in Oregon and Washington.

Specimens examined:

OREGON: Type specimens as cited under type locality; bluffs of the Columbia at Grants, *Howell* 1505, April, 1889.

WASHINGTON: Rocky river bank near Columbus, Klickitat County, *Suksdorf* 863, April–June, 1886.

31. **Lomatium cusickii** (Watson) C. & R.

Peucedanum cusickii Watson, Proc. Am. Acad. **21**: 453. 1886.

Dwarf, caulescent, cespitose, glabrous, from a thick elongated root; stems 4 to 12.5 cm. high; leaves once to twice ternate, the segments with 3 to 5 linear acute lobes from 6 to 24 mm. or more long; umbel with 1 to 3 short fertile rays, and involucels of narrow acuminate bractlets distinct or more or less united; pedicels very short; flowers white; fruit oblong-elliptical, 8 to 12 mm. long, the thin wings as broad as the body or narrower; oil tubes 1 to 3 in the intervals, 4 or 6 on the commissural side; seed face concave.

Type locality, "on the highest summits of the Eagle Creek Mountains [altitude 2,700 meters], Union County, Oreg.;" collected by *Cusick*, no. 1280, September, 1885; type in Herb. Gray, duplicate in U. S. Nat. Herb.

High mountains of eastern Oregon.

Specimens examined:

OREGON: Type specimens as cited under type locality; Powder River Mountains, altitude 2,400 meters, *Piper* 2333, August, 1896; Blue Mountains, *Cusick* 1776*a*, in 1897.

32. **Lomatium platycarpum** (Torr.) C. & R.

Peucedanum triternatum platycarpum Torr. Stansb. Rep. 389. 1852.
Peucedanum simplex Nutt. Bot. King Surv. 129. 1871.

Caulescent or acaulescent, puberulent, often tall and stout; leaves ternate or biternate; leaflets from very narrowly linear (almost filiform) to linear-lanceolate, 5 to 10 cm. long; umbel unequally 3 to 15-rayed, with involucels of lanceolate or setaceous bractlets; rays 1 to 7.5 cm. long; pedicels 2 to 6 mm. long; flowers yellow; fruit broadly oblong to nearly orbicular, sometimes emarginate at each end, 6 to 12 mm. long, 4 to 10 mm. broad, with wings broader than body (also extending below body), and prominent dorsal and intermediate ribs; oil tubes large and solitary in the intervals, 2 on the commissural side; seed face slightly concave.

Type locality, Stansburys Island, Salt Lake, Utah; collected by *Stansbury Exped.;* type in Herb. Columbia Univ.

From Utah and western Colorado to western Montana and eastern Washington.

Specimens examined:

UTAH: Wasatch Mountains, altitude 2,100 meters, *Watson* 465, June, 1869; Utah Valley, altitude 1,500 meters, *Jones* 1678, May 3, 1880; Springville, *Jones*, June 3, 1898.

COLORADO: Fort Lewis, southwestern Colorado, *Alice Eastwood* 21, June 10, 1890; Glenwood Springs, *Osterhout*, June, 1895.

WYOMING: Yellowstone Park, *Tweedy*, June, 1885; same station, *Rose* 169, 232, August 10–19, 1893; same station, *Burglehaus*, July, 1893; La Barge, Uinta County, *Stevenson*, June–July, 1894; Evanston, Uinta County, *Nelson* 2967, May 28, 1897; Mammoth Hot Springs, Yellowstone Park, *A. & E. Nelson* 5592, June 30, 1899.

MONTANA: Belt River, *Williams* 10, May–July, 1881; Helena, *Kelsey* 260, May 16, 1887; *Tweedy*, in 1889; near Red Lodge, *Rose* 15, July 26, 1893; Spanish Basin, *Rydberg* 4621, June 24, 1897.

IDAHO: *Wilcox*, in 1883; near Pocatello, *Palmer* 48, May 17, 1893; near Lewiston, Nez Perces County, *Henderson*, April–June, 1894; Big Camas Prairie, altitude 1,500 meters, *Henderson* 3177, July 14, 1895.

OREGON: High ridges, eastern Oregon, *Howell* 182, June, 1880; *Cusick* 1171, in 1884; Pine Creek, Gilliam County (altitude 490 meters), Farewell Bend, Crook County (altitude 1,270 meters), and near Fort Klamath (altitude 1,470 meters), *Leiberg* 168, 432, 655, June–August, 1894.

WASHINGTON: North Yakima, Yakima County, *Palmer*, in 1890; same station, *Henderson* 2513, May–July, 1892; Waitsburg, Walla Walla County, *Horner* 223, June 12, 1897.

33. **Lomatium triternatum** (Pursh) C. & R.

Seseli triternatum Pursh, Fl. 1: 197. 1814.
Peucedanum triternatum Nutt. in Torr. & Gray, Fl. 1: 626. 1840.

Caulescent or acaulescent, puberulent, 3 to 7.5 dm. high; leaves biternate to triternate; leaflets from narrowly linear to linear-lanceolate, 5 to 10 cm. long; umbel unequally 5 to 18-rayed, with involucels of lanceolate or setaceous bractlets; rays 1 to 5 cm. long; pedicels 2 to 4 mm. long; flowers deep yellow; fruit narrowly oblong, glabrous, 6 to 12 mm. long, 3 to 4 mm. broad, with narrow wings and somewhat prominent dorsal and intermediate ribs; oil tubes very large and broad, solitary in the intervals, 2 on the commissural side; seed face very slightly concave.

Type locality, "on the waters of Columbia River," Oregon or Washington, or, according to Dr. Coues, "on the main Kooskooskee;" collected by *Lewis;* type (leaves only) in Herb. Philad. Acad. (*fide* Robinson & Greenman).

From northeastern California to British Columbia.

ILLUST. Hook. Fl. Bor. Am. 1: 264. pl. 94. 1834.

Specimens examined:

CALIFORNIA: Cisco, Plumas County, *Mrs. R. M. Austin.*

OREGON: Klamath Valley, altitude 1,260 meters, *Cronkhite* 43, in 1864; Silverton, Marion County, *Hall* 214, in 1871; *Howell*, June, 1880; near Rock Creek, Morrow County, altitude 1,040 meters, *Leiberg* 87, May 22, 1894; Klamath

County, *Applegate* 232, March 31, 1896; Malheur County, altitude 1,100 to 1,200 meters, *Leiberg* 2143, 2154, May 27–28, 1896; near Harney, Blue Mountains, *Coville* 525, July 10, 1896; *Sheldon* 8342, in 1897; *Cusick* 1852, April–June, 1898.

WASHINGTON: Upper Columbia and Puget Sound, *Wilkes Exped.* 296; E. Wash., *G. R. Vasey*, in 1883; Spokane County, *Suksdorf*, June 23, 1884; *G. R. Vasey* 299, in 1889; Pierce County, *Smith*, May, 1890; *Whited*, March–May, 1896; Goat Mountains (Cascades), altitude 900 to 1,500 meters, *Allen* 257, June–September 1896; Pullman, Whitman County, *Elmer* 846, May, 1897; between Olympia and Gate City (Thurston County) and near Satop (Chehalis County), *A. A. & E. Gertrude Heller* 4056, 4060, July 15–19, 1898.

IDAHO: Cœur d'Alene Mountains, *Leiberg* 403, July 28, 1895; Paradise Creek, Moscow, *Henderson* 4598, June 6, 1897.

WYOMING: Yellowstone National Park, *Burglehaus*, May, 1893.

BRITISH COLUMBIA: Lytton, *Macoun* 13, April 17, 1889.

34. **Lomatium robustius** C. & R.

Peucedanum triternatum macrocarpum C. & R. Rev. N. Am. Umbell. 70. 1888. Not *Peucedanum macrocarpum* Nutt.

Peucedanum triternatum robustius C. & R. Contr. Nat. Herb. **3**: 228. 1895.

Very stout, caulescent, and the caudex becoming multicipital; leaves much as in the broader leaved forms of *L. triternatum;* umbel unequally 5 to 10-rayed, with involucels of linear or setaceous bractlets; rays 2 to 6 cm. long; pedicels 2 to 4 mm. long; flowers yellow, with puberulent ovaries becoming more or less glabrate in fruit; fruit oblong, 12 mm. long, 5 mm. broad, with wings half as broad as body; oil tubes solitary in the intervals.

Type locality, low grounds, W. Klickitat County, Wash.; collected by *Suksdorf*, no. 502, May–July, 1883; type in U. S. Nat. Herb.

Eastern Washington and Oregon.

Specimens examined:

WASHINGTON: Type specimens as cited under type locality.

OREGON: Dalles, *Kellogg*, June, 1869; prairies, Hood River, *Henderson* 390, May–August, 1883; near Grizzly Butte, Crook County, altitude 1,040 meters, *Leiberg* 297, June 19, 1894.

35. **Lomatium alatum** C. & R.

Peucedanum triternatum alatum C. & R. Rev. N. Am. Umbell. 70. 1888.

Caulescent and puberulent; leaves ternate then once or twice pinnate, with very narrowly linear and elongated rather numerous crowded segments 1 to 6 cm. long; umbel unequally 5 to 10-rayed, with no involucels; rays 2 to 6.5 cm. long; pedicels 4 to 7 mm. long, flowers yellow, with puberulent ovaries becoming more or less glabrate in fruit; fruit oblong, 10 to 12 mm. long, with wings more than half as broad as body, and prominent sharp or even slightly winged dorsal and intermediate ribs; oil tubes large and solitary in the intervals.

Type locality, "Folsom," Sacramento County, Cal.; collected by *M. K. Curran*, April, 1884; type in Herb. Coulter.

Eastern Oregon and northeastern California.

Specimens examined:

Oregon: "Gulches and vernal stream banks;" Union County, *Cusick* 1098, June, 1883.

California: Type specimens as cited under type locality; Modoc County, *Jones*, June, 1884.

36. **Lomatium grayi** C. & R.

Peucedanum millefolium Watson, in Bot. King Surv. 129. 1871. Not Sonder, 1861–1862.

Peucedanum grayi C. & R. Bot. Gaz. **13**: 209. 1888.

Glabrous throughout, with peduncles 7.5 to 22.5 cm. long; leaves ternate then pinnately decompound, the ultimate segments linear-filiform, elongated or short, cuspidate, exceedingly numerous; umbel rather equally 6 to 16-rayed, with involucels of distinct linear subulate bractlets; rays 2.5 to 7.5 cm. long; pedicels 10 to 16 mm. long; flowers yellow; fruit oblong, 8 to 16 mm. long, 5 to 9 mm. broad, with wings usually more than half as broad as body, and filiform dorsal and intermediate ribs; oil tubes usually solitary in the intervals (sometimes 2 in the lateral intervals), 2 or 4 on the commissural side.

Type locality, "Antelope Island, [Great] Salt Lake," Utah; collected by *Watson*, no. 466; type in Herb. Gray.

From eastern Washington and Oregon to Wyoming and Colorado.

Specimens examined:

Washington: Dry rocks, Columbia River, *Suksdorf*, April–June, 1883; eastern Washington, *G. R. Vasey* 103, in 1883; near Ellensburg, Kittitas County, *G. R. Vasey*, August 1, 1889; Yakima and Spokane counties, *Henderson* 396, May–June, 1892; *Sandberg & Leiberg* 5, 180, in 1893; Pullman and Wawawai, Whitman County, *Piper* 1564, 1767, May–July, 1893; Blue Mountains, Wallawalla County, *Piper* 2339, July 15, 1896; *Sheldon* 8090, 8192, in 1897; Wawawai and Pullman, Whitman County, *Elmer* 92, 95, May, 1897.

Oregon: *Howell*, May–June, 1880; dry rocks on mountain slopes near Hood River, *Suksdorf*, May–July, 1883; *Cusick* 472, in 1884; Morrow County, *Leiberg* 36, 57, May 7–12, 1894; Malheur County, altitude 1,200 meters, *Leiberg* 2132, May 25, 1896; hills near Snake River, *Cusick* 1915, June 12, 1898.

Idaho: Lower Clearwater River, Nez Perces County, *Sandberg* 22, April 24, 1892; Julietta, Latah County, *Henderson*, April 21, 1894; about Lewiston, Nez Perces County, *A. A. & E. Gertrude Heller* 2994, 3043, April–May, 1896; Mann's Creek (Washington County), and Cuddy Mountains, *Jones*, July 8–11, 1899.

Wyoming: La Barge, Uinta County, *Stevenson* 15, June, 1894; Evanston, Uinta County, *Nelson* 2979, May 29, 1897.

Utah: Antelope Island, Salt Lake, altitude 2,700 meters, *Watson* 466, June, 1869; Lake Point, *Jones* 1728, May 20, 1880; Garfield, *Jones*, May 30, 1890; Dugway, *Jones*, May 26, 1891; Fairview, *Jones* 5548, June 30, 1894; Thistle, *Jones*, June 23, 1898.

Colorado: Durango, *Alice Eastwood*, May–June 6, 1890 and 1891; Glenwood Springs, *Alida Lansing*, May, 1892; same station, *Osterhout*, June, 1895; Mancos, altitude 2,100 meters, *Baker*, *Earle*, & *Tracy* 80, June 24, 1898.

37. **Lomatium torreyi** C. & R.

Peucedanum torreyi C. & R. Bot. Gaz. **14**: 276. 1889.

Short caulescent, 7.5 to 30 cm. high, glabrous, slender, clothed at base with old leaf sheaths; leaves small, ternate-pinnate or bipinnate, with very short (2 to 6 mm.) linear acute-tipped segments; umbel unequally few-rayed, with involucels of 1 or 2 small bractlets or none; rays 2.5 cm. long or less; pedicels 2 to 4 mm. long; flowers yellow; calyx teeth small or obsolete; fruit narrowly oblong, 8 to 12 mm. long, with wings not half as broad as body; oil tubes solitary in the intervals.

Type locality, "Yosemite Valley, California;" collected by *M. K. Curran*, June, 1883; type in Herb. Coulter.

Only known from the type locality.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; same station, *Torrey* 165, in 1865 (in Herb. Gray).

This species was described without name in Bot. Calif. **1** : 263. 1876, as a plant closely allied to *Podosciadium*.

38. **Lomatium sandbergii** C. & R.

Peucedanum sandbergii C. & R. Bot. Gaz. **13** : 79. 1888.

Caulescent, branching at base, 2.5 cm. to 3 dm. high, from an elongated comparatively slender root, rough puberulent; petioles wholly inflated, with a very conspicuous white scarious margin; leaves ternately or pinnately dissected, the ultimate segments very short linear; umbel very unequally 6 to 15-rayed, with involucels of distinct linear-lanceolate bractlets; rays 2.5 to 10 cm. long; pedicels 2 to 4 mm. long; flowers bright yellow; fruit ovate, puberulent, 4 to 5 mm. long, 3 mm. broad, with very narrow wings, and filiform dorsal and intermediate ribs; oil tubes 4 or 5 in the intervals, 6 on the commissural side; seed face plane.

Type locality, "bare mountain tops [altitude 1,500 meters] along snowdrifts, Kootenai County, northern Idaho;" collected by *Sandberg*, no. 47, July, 1887; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Alpine in northern Idaho, adjacent Montana, and Alberta.

Specimens examined:

IDAHO: Type specimens as cited under type locality; Cœur d'Alene Mountains, altitude 1,900 meters, *Leiberg* 235, 401, July 11–28, 1895.

MONTANA: Near Columbia Falls, altitude 2,100 meters, *Williams* 969, July 12, 1894.

ALBERTA: Sheep Mountain, Waterton Lake, *Macoun* 10686, July 28–31, 1895.

39. **Lomatium microcarpum** (Howell) C. & R.

Peucedanum microcarpum Howell in C. & R. Rev. N. Am. Umbell. 65. 1888.

Closely resembling *L. sandbergii*, but differing in its stouter habit; petioles without conspicuous margins; somewhat equally-rayed umbels; deeper yellow flowers; glabrous fruit, which is oblong and 5 mm. long, and much earlier blooming.

Type locality, "on cliffs, Roseburg, Umpqua Valley, Oregon;" collected by *Howell*, no. 709, April 20, 1887; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:

OREGON: Type specimens as cited under type locality.

40. **Lomatium donnellii** C. & R.

Peucedanum donnellii C. & R. Bot. Gaz. **13**: 143. 1888.

Short caulescent or acaulescent, 1.5 to 3 dm. high, glabrous, from a fusiform root; leaves ternate then pinnately decompound, with segments pinnately cleft into short oblong or linear lobes; umbel somewhat unequally 6 to 12-rayed, with involucels of linear acuminate bractlets; rays 2.5 to 10 cm. long; pedicels 4 to 16 mm. long; flowers yellow; fruit ovate to broadly oblong, glabrous, 7 to 8 mm. long, 4 to 6 mm. broad, with wings less than half as broad as body, and prominent dorsal and intermediate ribs; oil tubes small, 4 to 6 in the intervals, 4 to 6 on the commissural side.

Type locality, "John Day Valley", Oregon; collected by *Howell*, no. 829, May 10, 1885; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Eastern Oregon and adjacent Idaho.

Specimens examined:

OREGON: Union County, *Cusick* 36, May, 1883; type specimens as cited under type locality; near Lone Rock, Gilliam County, altitude 1,240 meters, *Leiberg* 111, May 23, 1894; Otis Creek, Malheur County, altitude 1,100 meters, *Leiberg* 2329, June 19, 1896; hillsides of Agency Valley (Mathews County), and Logan Valley (Blue Mountains), *Cusick* 1622, June, 1897; *Cusick* 1857, May–June, 1898.

IDAHO: About Lewiston, Nez Perces County, altitude 750 to 900 meters, *A. A. & E. Gertrude Heller*, May, 1896.

41. **Lomatium lemmoni** C. & R.

Peucedanum lemmoni C. & R. Bot. Gaz. **14**: 277. 1889.

Caulescent, with most of the leaves near the base, 3 to 4 dm. high, clothed at base with old leaf sheaths, from an elongated rather slender root, glabrous; leaves broad triangular in outline, 12.5 to 20 cm. long, including petiole, twice or thrice pinnate (or so broad as to appear at first ternate); the ultimate segments linear, 2.5 to 5 cm. long; uppermost leaves much smaller and simply pinnate; umbel 6 to 8-rayed, with involucels of a few almost filiform bractlets; rays short, 6 to 14 mm. long, making the fruits appear in a head-like cluster; pedicels 2 mm. long; flowers white (?); fruit oblong, glabrous, 5 mm. long, scarcely 4 mm. broad, with thickish wings about half as broad as body, and distinct dorsal and intermediate ribs; oil tubes solitary in the dorsal intervals, 2 or 3 in the lateral, 4 to 6 on the commissural side; seed face plane.

Type locality, "Huachuca Mountains," southeast Arizona; collected by *Lemmon*, no. 392, June, 1887; type in U. S. Nat. Herb.

Only known from the type locality.

Specimens examined:

ARIZONA: Type specimens as cited under type locality.

42. **Lomatium congdoni** C. & R., sp. nov.

Acaulescent, glabrous; peduncles ascending, 1.5 to 2 dm. long, terete, purplish; leaves first quinate, the middle division elongated, then twice to thrice pinnate; the ultimate segments short, linear, acute, mostly entire, glabrous above, slightly scabrous beneath; sheath narrow and slender, extending the full length of the petiole; umbels with 6 to 8 fertile rays, and no involucels; rays 2 to 5 cm. long; pedicels spreading, 6 to 8 mm. long; fruit nearly elliptical, slightly broader above, 8 mm. long, 5 mm. broad, with wings slightly narrower than body, and filiform dorsal and intermediate ribs; oil tubes very indistinct, one or perhaps more in the intervals.

Type locality, West Water Ditch, Mariposa County, Cal.; collected by *J. W. Congdon*, no. 114, May 12 and 25, 1893; type in U. S. Nat. Herb.

Mariposa County, Cal.

Specimens examined:

CALIFORNIA: Mariposa, Mariposa County, *Congdon*, May 24, 1892; type specimen as cited under type locality.

43. **Lomatium plummerae** C. & R.

Peucedanum plummerae C. & R. Bot. Gaz. **14**: 278. 1889.

Short caulescent, with a cluster of stout widely spreading peduncles (2 to 3 dm. high) rising much above the leaves and from a thick tuberous root, glabrous and somewhat glaucous; leaves ternately decompound, the numerous crowded ultimate segments very small, oblong, more or less confluent; umbel very unequally 6 to 12-rayed, with involucels of numerous lanceolate acuminate bractlets; rays 1 to 7.5 cm. long; pedicels 4 to 8 mm. long; flowers white; fruit oblong, but usually acute at apex, glabrous, 8 to 9 mm. long, 4 to 5 mm. broad, with wings from half to as broad as body, and indistinct dorsal and intermediate ribs; oil tubes 2 or 3 in the intervals, 4 to 6 on the commissural side.

Type locality, "Sierra Valley, Sierra County," Cal.; collected by *Lemmon*, no. 32, May, 1889; type in U. S. Nat. Herb. Associated with the type in the original description is *Lemmon* 40 from near Shasta, Shasta County, June 28, 1889.

Northeastern California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

44. **Lomatium brevifolium** C. & R.

Peucedanum triternatum brevifolium C. & R. Rev. N. Am. Umbell. 70. 1888.

Rather stout and rough puberulent, resembling *L. triternatum*, but with smaller more compact leaves with stout inflated petioles and usually shorter broader and often toothed segments; umbels very unequally 5 to 15-rayed, with involucels of lanceolate or setaceous bractlets; rays 2.5 to 8.5 cm. long; pedicels 4 to 8 mm. long; flowers yellow, with puberulent ovaries becoming more or less glabrate in fruit; fruit narrowly oblong, 10 to 16 mm. long, 4 to 5 mm. broad, with wings half as broad as body or less; oil tubes solitary in the intervals.

Type locality, "Oregon, Klickitat County;" collected by *Howell*, no. 379, June 1, 1881; type in Herb. Coulter.

Oregon and Washington.

Specimens examined:

OREGON: Type specimens as cited under type locality; near Beulah, Malheur County, altitude 1,080 meters, *Leiberg* 2304, June 17, 1896; *Leiberg* 4312, in 1899.

WASHINGTON: Klickitat River, *Suksdorf* 1202, June 26, 1885; near Columbus, Klickitat County, *Suksdorf* 1203, June 10, 1886; Yelm Prairie, Thurston County, *Smith* 568, August, 1889; *G. R. Vasey*, in 1889; Klickitat hills, *Howell* 1368, April 26, 1891; *Sandberg & Leiberg* 596, in 1893.

45. **Lomatium macdougali** C. & R., sp. nov.

Resembling *L. foeniculaceum*, but lower, more inclined to branch at base, and persistently hirsute; leaves smaller, with more crowded segments; involucels of less conspicuous linear bractlets either distinct or somewhat united, hirsute; rays 1 to 5 cm. long; pedicels 8 to 10 mm. long; flowers purple to yellow; fruit elliptical, somewhat pubescent, 6 to 7 mm. long, 4 mm. broad, with wings less than half as broad as body; oil tubes several in the intervals.

Type locality, Mormon Lake, Arizona, altitude 1,800 meters; collected by *MacDougal*, no. 84, June 11, 1898; type in U. S. Nat. Herb.

Arizona, Utah, and Nevada.

Specimens examined:

ARIZONA: Mohave County, *Newberry*, March 29, 1858; *Mrs. Thompson* 98, in 1872; Ash Fork, *Rusby* 3164, May 12, 1883; northern Arizona, *Lemmon;* Walnut Canyon and Flagstaff, *MacDougal* 84, May–June, 1891; type specimens as cited under type locality.

UTAH: *Capt. Bishop* 30, in 1872.

NEVADA: Battle Mountains, altitude 2,100 meters, *Watson* 470, June, 1868 (distributed as *Peucedanum* (?) *villosum* Nutt.); Mount Magruder, Esmeralda County, *V. Bailey* 2008, June 5, 1891; Palmetto Range, altitude 2,700 to 3,000 meters, *Purpus* 5867, in 1898.

This species approaches *L. mohavense* of the Mohave Desert, California, but may be distinguished by its softer pubescence, purple to yellow flowers, and smaller fruit.

46. **Lomatium jonesii** C. & R., sp. nov.

Resembling *L. foeniculaceum*, but lower, more inclined to branch at base, at least the foliage persistently villous; leaves smaller, with more crowded segments; involucels of less conspicuous linear usually distinct and villous bractlets; rays 1 to 3 cm. long; pedicels 3 to 12 mm. long; flowers yellow or tinged with purple; fruit elliptical or broadly oblong, pubescent, 8 mm. long, 6 to 7 mm. broad, with broader wings (more than half as broad as body).

Type locality, Irelands Ranch, head of Salina Canyon, Utah, altitude 2,400 meters; collected by *Jones*, no. 5435, June 15, 1894; type in U. S. Nat. Herb.

From Utah through Idaho, western Wyoming, and western Montana to Northwest Territory.

Specimens examined:

UTAH: Dog Valley and Frisco, altitude 1,500 meters, *Jones* 1689, April 28, 1880; Salina Canyon (altitude 1,560 meters) and Emery (altitude 2,100 meters), *Jones* 5422, 5445, June 14–16, 1894; type specimens as cited under type locality.

IDAHO: *Ainslie;* near Pocatello, *Palmer* 12, May 20, 1893; *Barton*, in 1895.

WYOMING: Fort Steele, *Nelson* 4835, June 18, 1898.

MONTANA: Belt River, *Williams* 150, April 24, 1881; Jefferson County, *Tweedy*, June, 1888.

NORTHWEST TERRITORY: Along Maple Creek, *Macoun*, May, 1884.

47. **Lomatium mohavense** C. & R.

Peucedanum mohavense C. & R. Rev. N. Am. Umbell. 62. 1888.

Resembling *L. tomentosum* in habit, but with much more strigose pubescent leaves, which are dissected into very small much crowded linear-oblong or obovate obtuse segments; umbel somewhat unequally 6 to 10-rayed, with involucels of linear to lanceolate acuminate bractlets; fertile rays 2.5 to 5 cm. long; pedicels 4 to 8 mm. long; flowers probably white; calyx teeth obsolete; fruit broadly elliptical to almost orbicular, with close fine pubescence, 8 to 10 mm. long, 6 to 8 mm. broad, with wings not as broad as body, and prominent and approximate dorsal and intermediate ribs; oil tubes 3 or 4 in the intervals, 8 to 10 on the commissural side.

Type locality, "Yucca, Mohave Desert, California;" collected by *M. K. Curran*, June, 1884; type in Herb. Coulter, fragments in U. S. Nat. Herb.

Southeastern California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; also probably the following plants: Morongo Pass, San Diego County, *Parish* 597 B, April, 1882; Hesperia, Mohave Desert, *Parish* 3608, June 14, 1895.

Parish 3608 has smaller fruit than the type, but otherwise seems to represent the species. *L. macdougali* of Arizona approaches this species most nearly, but *L. mohavense* has much harsher pubescence throughout (that of the fruit being much stronger and harsher), white flowers, and usually larger fruit.

48. **Lomatium argense** (Jones) C. & R.

Peucedanum argense Jones, Contr. Western Botany no. 8: 30. 1898.

Acaulescent, with stout peduncles 1 to 3 dm. high and somewhat exceeding the leaves, the whole plant hoary with short pubescence; leaves pinnately decompound (or the primary division appearing ternate); the ultimate segments very small and thick, oblong to obovate, apiculate; umbel nearly equally 10 to 15-rayed, with involucels of linear to lanceolate-subulate bractlets; rays stout, 2.5 to 3.5 cm. long; pedicels about 2 mm. long; flowers "white, yellow, or purple:" fruit from broadly ovate to orbicular, pubescent, 5 to 7 mm. long, with wings half to as broad as body, and distinct filiform dorsal and intermediate ribs; oil tubes 3 in the intervals, 4 on the commissural side; seed face plane.

Type locality, among rocks, "Lone Pine, Inyo County, Cal.," altitude 2,100 meters; collected by *Jones*, May 14, 1897; type in Herb. Jones.

Inyo County, Cal.

Specimens examined:

CALIFORNIA: Walker Pass (altitude 900 to 1,200 meters), and Argus Mountain (altitude 1,200 to 1,500 meters), *Purpus* 5352, 5479, in 1897.

Fruit a little smaller than in *L. mohavense*, but otherwise too near it.

49. **Lomatium parishii** C. & R.

Peucedanum parishii C. & R. Bot. Gaz. **13**: 209. 1888.

Caulescent or acaulescent, 1 to 3 dm. high, glaucous, closely pubescent, from a thick elongated root; leaves pinnate, with pinnatifid to entire leaflets, the ultimate oblong-linear or linear segments cuspidate, somewhat toothed or entire; basal leaves sometimes nearly entire or few-cleft; umbel unequally 4 to 12-rayed, with involucels of small linear-lanceolate acuminate bractlets; rays 2.5 to 12.5 cm. long; pedicels 4 to 8 mm. long; flowers white; fruit somewhat obovate, glabrous, 7 to 12 mm. long, 4 to 8 mm. broad, with the usually narrow wings in robust specimens sometimes becoming almost as broad as body, and filiform or obsolete dorsal and intermediate ribs; oil tubes exceedingly small, often obscure, 6 to 8 in the intervals, 8 to 10 on the commissural side; seed face concave.

Type locality, rocky hillsides, "Bear Valley," San Bernardino County, Cal., altitude 1,800 meters; collected by *S. B. Parish*, no. 1828, June, 1886; type in Herb. Coulter, duplicate in U. S. Nat. Herb.

Southern California and adjacent Nevada.

Specimens examined:

CALIFORNIA: *Lemmon*, in 1875; type specimens as cited under type locality; high ridges on Old Baldy Mountain, San Bernardino County, *Parish* 1942, June, 1887; Panamint Mountains (Inyo County), altitude 1,950 to 2,330 meters, *Coville & Funston* 541, 745, April–May, 1891; ridges, San Bernardino Mountains, Los Angeles County, altitude 810 meters, *Hasse*, May 21, 1893; type locality, *Parish* 3366, June, 1894 and 1895; foothills, Antelope Valley, Los Angeles County, altitude 900 meters, *Davidson*, May 6, 1895.

NEVADA: Mica Springs, southern Nevada, altitude 1,200 meters, *Jones* 5064, 5072, April 14–16, 1894.

50. **Lomatium juniperinum** (Jones) C. & R.

Peucedanum juniperinum Jones, Contr. to Western Botany no. 8: 29. 1898.

Caulescent, ashy-puberulent, about 3 dm. high, from a tuberous root, with one or few slender purplish stems; leaves about 7.5 cm.

long, ternate to biternate then bipinnate; ultimate segments linear to lanceolate, acute, 2 to 4 mm. long; sheaths enlarged; umbel with about 20 unequal rays (about 6 fertile), rarely a simple or leaf-like involucral bract, and involucels of several filiform subulate bractlets; fertile rays 2.5 to 5 cm. long; fertile pedicels 6 to 10 mm. long; flowers yellow; fruit elliptical, 6 to 8 mm. long, 4 mm. wide, with wings a little narrower than body, and evident dorsal and intermediate ribs; oil tubes 2 in the dorsal intervals, 3 in the lateral, a small one on the inner edge of the wing, and 4 on the commissural side; seed face plane.

Type locality, "at Coalville, Utah, among junipers;" collected by *Jones*, May 14, 1889; type in Herb. Jones, fragment and photograph in U. S. Nat. Herb. Associated with the type is Jones's specimen, from Carter, southwest Wyoming, June 25, 1896.

Utah and adjacent Wyoming.

Specimens examined:

UTAH: Type specimens as cited under type locality.

51. **Lomatium austinae** C. & R.

Peucedanum austinae C. & R. Bot. Gaz. **13**: 208. 1888.

Resembling *L. hallii*, but pubescent (?), with leaf segments larger and pinnate, with narrow often toothed divisions; flowers purplish: fruit 7 mm. long, 3 mm. broad; oil tubes solitary in the dorsal intervals, mostly 2 in the lateral, 4 on the commissural side, and an additional one in each group of strengthening cells; seed face concave, with central longitudinal ridge.

Type locality, Big Meadows, "Plumas County," Cal.; collected by *Mrs. R. M. Austin*, June, 1880; type in Herb. Coulter.

In the mountains of northeastern California, from Sierra County to Siskiyou County.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; Sierra County, *Lemmon:* Yreka, Siskiyou County, *Greene* 732.

52. **Lomatium sonnei** C. & R., sp. nov.

Short caulescent, 2 to 3 dm. high, from a slender elongated root, puberulent; leaves ternate then pinnately compound, the ultimate segments short linear; umbels unequally 5 to 8-rayed, with involucels of linear scarious-margined bractlets united at base; rays 2 to 4 cm. long; pedicels 4 to 6 mm. long; flowers yellow; fruit elliptical, glabrous, 8 mm. long, 4 mm. broad, with wings nearly as broad as body, and filiform dorsal and intermediate ribs; oil tubes large and solitary in the intervals.

Type locality, sandy soil among sagebrush, Verdi, Washoe County, Nev.; collected by *Sonne*, May 5 and June 16, 1895; type in U. S. Nat. Herb.

Washoe County, Nev., and Nevada County, Cal.

Specimens examined:

NEVADA: Type specimens as cited under type locality.

CALIFORNIA: Near Truckee, Nevada County, *Sonne*, May 23, 1886.

53. **Lomatium bicolor** (Watson) C. & R.

Peucedanum bicolor Watson, Bot. King Surv. 129. 1871.

Caulescent or scarcely so, 1 to 4.5 dm. high, glabrous or slightly puberulent; petioles wholly dilated; leaves ternate then pinnately decompound, the ultimate segments very numerous and filiform; umbel very unequally 2 to 10-rayed, with involucels of 1 to 8 linear-subulate bractlets; rays 2.5 to 12.5 cm. long; pedicels short; flowers yellow; fruit linear-oblong, glabrous, 10 to 12 mm. long, 2 to 5 mm. broad, with very narrow wings and nearly obsolete dorsal and intermediate ribs; oil tubes large and solitary in the intervals, 2 on the commissural side.

Type locality, Parleys Park, "Wasatch Mountains, Utah," altitude 1,500 to 1,950 meters; collected by *Watson*, no. 467, May–June, 1869; type in U. S. Nat. Herb.

Utah and Idaho, and adjacent Wyoming.

Specimens examined:

UTAH: Type specimens as cited under type locality; City Creek Canyon, altitude 1,920 meters, *Jones* 1713, May 15, 1880; same station, *Jones*, June 6, 1898.

IDAHO: Kootenai County, *Leiberg* 474, May, 1890; Weisners Peak, Kootenai County, *Sandberg* 596, July 8, 1892; Cœur d'Alene River, Kootenai County, *Leiberg* 631, May–July, 1892.

WYOMING: La Barge, Uinta County, *Stevenson*, July 21, 1894.

Mr. M. E. Jones writes as follows in reference to this species: "This plant, which is sporadic in its type locality in Utah, here reaches its full development on the gumbo soil of Idaho. There are acres of it."

54. **Lomatium anomalum** Jones, sp. nov.

Caulescent, glabrous, or somewhat puberulent, rather stout, 3 to 4.5 dm. high, tufted from a large root; stem leaves 2, large, with wholly dilated petioles, ternate and then once or twice pinnate; ultimate segments linear-lanceolate to oblanceolate, acute, often lobed, 1 to 7.5 cm. long, 2 to 16 mm. broad; fertile umbels unequally 5 to 15-rayed, with involucels of linear or setaceous bractlets; rays 5 to 15 cm. long; pedicels 3 to 6 mm. long; flowers yellow, with glabrous ovaries; fruit from elliptical and 6 mm. long to narrowly oblong and 12 mm. long, 4 to 5 mm. broad, with wings not half to nearly as broad as body, and prominent more or less winged dorsal and intermediate ribs; oil tubes very large, solitary in the intervals, 4 on the commissural side.

Type locality, rocky gumbo soil, slopes of Indian Valley, Washington County, Idaho, altitude 1,200 meters; collected by *Jones*, July 15, 1899; type in Herb. Jones, duplicate in U. S. Nat. Herb.

Idaho and adjacent Oregon.

Specimens examined:

IDAHO: Type specimens as cited under type locality; along Hatwai Creek, Nez Perces County, *Sandberg* 28, April 24, 1892; Camas Prairie, *Henderson* 2660, June 24, 1894; forks of St. Marys River, Cœur d'Alene Mountains, altitude 1,000 meters, *Leiberg* 128, July 1, 1895; about Lewiston, Nez Perces County, *A. A. & E. Gertrude Heller* 3132, May 27, 1896.

OREGON: Hills near Snake River, *Cusick* 1905, May 31, 1898.

55. **Lomatium platyphyllum** C. & R.

Peucedanum latifolium Nutt. in Torr. & Gray, Fl. **1**: 625. 1840. Not DC.

Peucedanum nuttallii Watson, Bot. King Surv. 128. 1871, not *Seseli nuttallii* Gray (1870).

Resembling *L. nudicaule*, but smaller; leaves once or twice ternate, with ovate to orbicular leaflets cuneate to cordate at base; pedicels usually of the longer type; fruit ovate to oblong, 8 mm. long, 6 mm. broad, and very narrowly winged; oil tubes small, 3 in the intervals, 4 to 6 on the commissural side; seed face almost plane.

Type locality, "plains east of Wallawalla River, Oregon;" collected by *Nuttall;* type in Herb. Philad. Acad.

From northern Nevada to eastern Washington and adjacent Idaho.

Specimens examined:

NEVADA; Havallah Mountains, *Watson* 462, June, 1868; Aurum, White Pine County, altitude 2,190 meters, *Jones*, June 30, 1893.

OREGON: Type specimens as cited under type locality; "sterile stony ridges," *Cusick*, in 1884; near Rock Creek, Morrow County (altitude 790 meters), and near Grizzly Butte, Crook County (altitude 1,090 meters), *Leiberg* 82, 289, May–June, 1894.

WASHINGTON: Upper Columbia (no. 1090) and Spokane rivers, *Wilkes Exped.; Sandberg & Leiberg* 487, in 1893; *Whited*, April 12, 1896; Wenatchee Mountains, Kittitas County, altitude 1,200 meters, *Elmer* 475, July, 1897.

56. **Lomatium nudicaule** (Pursh) C. & R.

Smyrnium nudicaule Pursh, Fl. **1**: 196. 1814.

Ferula nudicaulis Nutt. Gen. **1**: 183. 1818.

Ferula nuttallii DC. Prodr. **4**: 174. 1830.

Seseli leiocarpum Hook. Fl. Bor. Am. **1**: 263. pl. 93. 1834.

Peucedanum leiocarpum Nutt. in Torr. & Gray, Fl. **1**: 626. 1840.

Peucedanum nudicaule Nutt. in Torr. & Gray, Fl. **1**: 627. 1840.

Peucedanum robustum Jepson, Erythea **1**: 9. 1893.

Acaulescent, glabrous, 3 to 6 dm. high, from a very long fleshy root; leaves biternate or ternate-quinate or sometimes simply ternate; leaflets thickish, from ovate to narrowly lanceolate, 2.5 to 5 cm. long, petiolulate or sessile, entire or toothed at apex; umbel very unequally 5 to 20-rayed, with neither involucre nor involucels; peduncles and rays dilated at summit; rays 2.5 to 20 cm. long; pedicels variable, 2 to 20 mm. long; flowers yellow; fruit narrowly oblong, 9 to 14 mm. long, 3 to 6 mm. broad, narrowly winged; oil tubes large and solitary in the intervals or 2 in the laterals, 4 or 6 on the commissural side; seed face somewhat concave.

Type locality, "on the Columbia River;" collected by *Lewis* (according to Dr. Coues, the exact date and locality for the type specimens are "April 15, 1806; Rock Fort Camp, at the Dalles of the Columbia"); type in Herb. Philad. Acad. The type locality of Hooker's *Seseli leiocarpum* is "on gravelly soils, near Fort Vancouver on the Columbia," Washington; collected by *Douglas*.

From central California to British Columbia and Idaho.

Specimens examined:

CALIFORNIA: Upper Sacramento Valley, *Parkinson;* Elk Ridge, Mendocino County, *Bolander* 6521, in 1867; Sierra Nevada Mountains, *Lemmon*, in 1875; Plumas County, *Mrs. R. M. Austin*, in 1880; Mount Shasta, Siskiyou County, *Palmer* 2533, July 13–27, 1892; Amador County, *Hansen* 332, June 17, 1894; Goose Lake Valley, Modoc County, *Mrs. R. M. Austin*, May, 1894; Mount Hamilton, *Rutter* 55, April 11, 1895.

OREGON: *Lt. Mullen's Exped.; Howell*, May–July, 1880; Malheur County, altitude 1,220 meters, *Leiberg* 2137, May 26, 1896; Klamath County, *Applegate* 233, June 28, 1896.

WASHINGTON: Puget Sound, *Wilkes' Exped.* 51; Klickitat County, *Suksdorf*, May–July, 1883; Ellensburg, Spokane County, *G. R. Vasey* 295, 297, May, 1889; Seattle, *Smith & Piper* 569, June 20, 1889; Clealum, Kittitas County, *Henderson*, June–July, 1892.

IDAHO: Big Camas Prairie, altitude 1,500 meters, *Henderson* 3178, July 14, 1895.

BRITISH COLUMBIA: Cedar Hill, Vancouver Island, *Macoun*, July, 1887.

This species is very variable in breadth of leaves, stalking of leaflets, length of pedicels, and size of fruit, but these variable characters do not work together or with geographical distribution in suggesting possible segregates.

Smyrnium nudicaule Pursh has been identified by Messrs. Robinson and Greenman (Proc. Philad. Acad. 28. 1898), who examined the type in the herbarium of the Philadelphia Academy, to be the same as *Seseli leiocarpum* Hook., which accords far better with the rather puzzling type locality of the former when the name was applied to plants of the eastern plains.

57. **Lomatium suksdorfii** (Watson) C. & R.

Peucedanum suksdorfii Watson, Proc. Am. Acad. **20**: 369. 1885.

Very stout and tall, glabrous or somewhat puberulent, 6 to 9 dm. high or more, from a very large root; leaves very large and decompound; leaf segments linear-oblong, 1 to 5 cm. long, entire or 2 to 3-cleft toward the top: umbel somewhat equally 6 to 12-rayed, with involucels of linear acuminate bractlets; rays 2.5 to 12.5 cm. long; pedicels 6 to 18 mm. long; flowers yellow; fruit narrowly oblong, 18 to 28 mm. long, 6 to 12 mm. broad, with wings narrower than body, and very prominent dorsal and intermediate ribs; oil tubes solitary, very large (filling the invervals), 2 on the commissural side; seed face somewhat concave.

Type locality, "on dry rocky mountain sides, W. Klickitat County, Washington Territory;" collected by *Suksdorf*, June–July, 1883; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Eastern Washington.

Specimens examined:

WASHINGTON: Type specimens as cited under type locality; *G. R. Vasey* 300, in 1889; *Sandberg & Leiberg* 489, in 1893.

58. **Lomatium giganteum** C. & R., sp. nov.

Caulescent or sometimes acaulescent, 4 to 7 dm. high, finely pubescent throughout; leaves very large, ternately compound; leaflets elongated, sometimes reaching 8 cm. in length, usually entire, very pale; rays very unequal, the longer ones 10 cm. long; pedicels 2 to 4 mm. long; involucel of linear bractlets; ovary pubescent; fruit linear-oblong, 18 mm. long, with wings much narrower than body, glabrous or nearly so.

Resembling *L. suksdorfii* in its stout habit, but with more elongated leaflets, pubescent ovaries, smaller fruit, etc.

Type locality, California; collected by *G. R. Vasey* in 1875; type in U. S. Nat. Herb.

Western California.

Specimens examined:

CALIFORNIA: Mendocino County, *Bolander* 5521. in 1867; probably same station, *Vasey*, in 1875.

"*Peucedanum* (*Ferula*, Gey.) *tenuissimum* Gey. MS." (in Hook. Lond. Journ. Bot. **6**: 235. 1847) is still doubtful. It is probably a good species, but more than likely has been described under some other name.

Peucedanum triternatum leptophyllum Hooker l. c. is also uncertain.

Both of these types are probably in the British Museum. Material which seems to represent these two forms was sent to Mr. E. G. Baker for comparison, and it is to be regretted that his report, now in transit, can not be incorporated in this work.

Peucedanum jaredi Eastwood (Zoe **5**: 88. 1900) is a new name which has come to us during the final proof revision.

59. EURYPTERA Nutt. in Torrey & Gray, Fl. 1: 629. 1840.

Calyx teeth minute or obsolete. Fruit strongly flattened dorsally, orbicular to shortly oblong. Carpel with filiform and approximate dorsal and intermediate ribs, and with broadly winged laterals (often much broader than the seed body and more or less distinct at base, making it cordate or emarginate) cohering until maturity with those of the other carpel; pericarp thin. Stylopodium wanting; disk impressed. Oil tubes one to several in the intervals. Seed strongly dorsally flattened, with plane face.

Acaulescent or caulescent glabrous perennials, with elongated roots, branching only at base, leaves once or twice compound, leaflets either broad or broad in outline and always sharply toothed, and yellow flowers.

Type species, *Euryptera lucida* Nutt.

A genus of 6 species belonging to the Pacific coast and islands.

The genus differs from typical *Lomatium* especially in its foliage, which is much more simple, with broad often orbicular leaflets, and sharp mucronate teeth. The wings of the fruit are inclined to be distinct, while in *Lomatium* the wings are united and project below the seed. Nuttall's genus *Euryptera*, based on a single species, was published by Torrey & Gray in 1840, but was reduced to a section of *Peucedanum* by Bentham & Hooker in *Genera Plantarum* in 1867, where it has since remained.

As we now understand the group, it is composed of 6 species possessing certain characters in common which enable them to be distinguished readily from the nearest related genus.

Oil tubes solitary in the intervals.
  More or less caulescent.
    Leaflets broadly cordate and somewhat lobed .... 1. *E. lucida.*
    Leaflets not cordate.
      Leaves bipinnate .... 2. *E. parvifolia.*
      Leaves biternate .... 3. *E. hassei.*
  Acaulescent and very pale .... 4. *E. pallida.*
Oil tubes not solitary in the intervals.
  Peduncles 3 to 4.5 cm. high; fruit 5 to 8 mm. long .... 5. *E. howellii.*
  Peduncles 15 cm. high; fruit 12 mm. long .... 6. *E. insularis.*

1. **Euryptera lucida** Nutt. in Torr. & Gray, Fl. **1**: 629. 1840.

FIG. 61.

Peucedanum euryptera Gray, Proc. Am. Acad. **7**: 348. 1868.

Short caulescent, glabrous, rather stout, 1.5 to 6 dm. high; leaves ternate; leaflets broadly cordate, somewhat lobed, coarsely mucronate-toothed, 1 to 2.5 cm. long; umbel equally 8 to 15-rayed, with involucels of lanceolate bractlets; rays 1 to 5 cm. long; pedicels 12 mm. long; flowers yellow; fruit nearly orbicular, emarginate at each end, glabrous, 10 to 14 mm. in diameter, with wings more than twice as broad as body, and prominent obtuse dorsal and intermediate ribs; oil tubes solitary in the intervals, 2 to 4 on the commissural side.

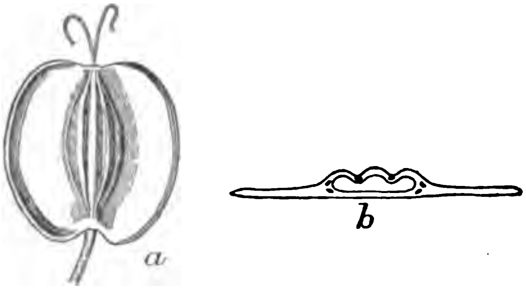


FIG. 61.—Euryptera lucida: *a*, × 2; *b*, × 3.

Type locality, "woods of San Diego, California;" collected by *Nuttall* in April; type in Herb. Philad. Acad.

Southern California, in San Diego, Los Angeles, and San Bernardino counties.

ILLUST. Bot. Mex. Bound. Rep. pl. 27.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; Fort Mohave and San Diego, *Cooper* 411, in 1860–61; San Diego, *Orcutt*, March 12, 1884; same station, *Cleveland*, in 1890; Sierra Madre, Los Angeles County, *Hasse*, April 4, 1890; plains west of San Bernardino, *Parish* 2132, April 4, 1891; Waterman Canyon, San Bernardino Mountains, *Parish* 3478, June 29, 1894..

2. **Euryptera parvifolia** (Hook & Arn.) C. & R.

Ferula parvifolia Hook. & Arn. Bot. Beechey 348. 1840.

Peucedanum parvifolium Torr. & Gray, Fl. **1**: 628. 1840.

Peucedanum californicum C. & R. Bot. Gaz. **13**: 143. 1888.

Short caulescent, slender, with a solitary peduncle 1 to 3 dm. high: leaves clustered near the base, usually large (1 to 1.5 dm. long), bipinnate (but the upper leaflets confluent); leaflets broad, obtuse (usually ending truncately or emarginately between two divaricate teeth), irregularly incised and with broad strongly cuspidate teeth; umbel 8 to 10-rayed, with involucels of linear or lanceolate acuminate bractlets; rays 1 to 3.5 cm. long; pedicels 6 to 8 mm. long; flowers yellow; fruit broadly elliptical to orbicular, 6 to 7 mm. long, scarcely emarginate, with wings broader than body, and rather prominent dorsal and intermediate ribs; oil tubes solitary in the intervals, 2 to 4 on the commissural side.

Type locality, in California, but station not given; collected by *Douglas*.

San Luis Obispo County, Cal.

Specimens examined:

CALIFORNIA: San Luis Obispo, *Jones* 3226, May 5, 1882; same station, *Mrs. R. W. Summers*, in 1889; San Simeon, *Brandegee*, June, 1889.

3. **Euryptera hassei** C. & R.

Peucedanum hassei C. & R. Bot. Gaz. **14**: 276. 1889.

Tall caulescent, stout, 6 dm. or more high, glabrous and somewhat glaucous, from a long slender woody root; leaves biternate, on very long petioles (sometimes 2.5 cm. including petiole); leaflets broadly ovate, with cuneate base, irregularly lobed, coarsely mucronate-toothed, 2.5 to 10 cm. long, becoming 6 cm. broad; umbel long-peduncled, equally 8 to 18-rayed, with involucels of bractlets which vary from rather short linear-setaceous to oblanceolate, foliaceous, entire or toothed and much exceeding the pedicels; rays 5 to 10 cm. long; pedicels 12 to 16 mm. long; flowers yellow; fruit as in *E. lucida*.

Type locality, canyon of Sierra Madre, "Los Angeles County, California;" collected by *Hasse*, March 27 and April 7, 1888; type in U. S. Nat. Herb., duplicate in Herb. Coulter.

Only known from type locality, excepting the specimen from Vaca Mountains, reported below by Jepson.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality; summit of the Vaca Mountains, *Jepson*, June 20, 1892 (*fide* Jepson).

4. **Euryptera pallida** C. & R., sp. nov.

Acaulescent, glabrous throughout and very pale; peduncles about 2 dm. high, exceeding the leaves; leaves pinnate (or first division appearing ternate), lowest pair of pinnae often pinnate; leaflets broad, with rhomboidal or irregularly angled outline, the very broad teeth mucronate tipped; fruiting umbel about 6-rayed, with involucels of few linear-lanceolate bractlets; rays 2.5 to 4 cm. long; pedicels 8 to 10 mm. long; fruit oblong, 10 mm. long, 6 to 7 mm. broad, emarginate at base, with wings as broad as body; oil tubes solitary.

Type locality, Santa Lucia Mountains, California; collected by *G. R. Vasey*, no. 232, July, 1880; type in U. S. Nat. Herb.

Only known from type locality.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

5. **Euryptera howellii** (Watson) C. & R. FIG. 62.

Peucedanum howellii Watson, Proc. Am. Acad. **20**: 369. 1885.

Acaulescent, with peduncle 3 to 4.5 cm. high; leaves biternate to biquinate; leaflets cuneate-orbicular to round-cordate, acutely dentate, often 3-lobed, 1 to 2.5 cm. long; umbel with few elongated and divaricate fertile rays, and involucels of acuminate lanceolate bractlets; rays 3 to 8.5 cm. long; pedicels 8 to 12 mm. long; fruit glabrous, broadly elliptical or nearly orbicular, emarginate, 5 to 8 mm. long, with wings about as broad as body or broader; oil tubes 3 or 4 in the intervals, 4 to 10 on the commissural side.

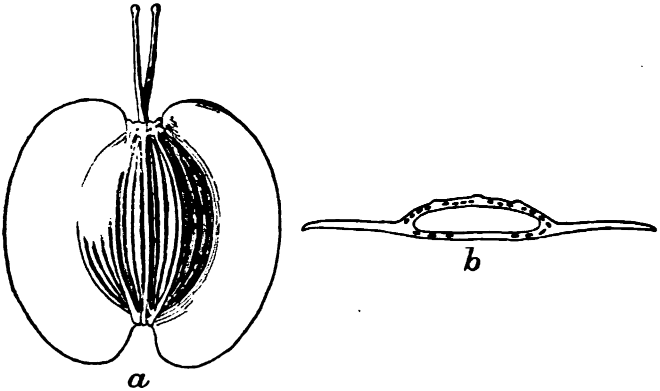


FIG. 62.—Euryptera howellii: *a*, × 6; *b*, × 8.

Type locality, "near Waldo, Josephine County, Oregon;" collected by *Howell*, June 6, 1884; type in Herb. Gray, duplicate in U. S. Nat. Herb.

Josephine County, Oregon.

Specimens examined:

OREGON: Type specimens as cited under type locality; same station, *Howell*, July 7, 1887.

6. **Euryptera insularis** (Eastwood) C. & R.

Peucedanum insulare Eastwood, Proc. Calif. Acad. Sci. III. 1: 106. pl. 8. 1898.

Acaulescent from a long rather stout root; peduncles stout, dilated at summit, 1.5 dm. high; leaves biternate to biquinate; leaflets cuneate, sharply dentate or incised, veiny; fruiting umbel 10 to 18-rayed, with involucre of a single elongated bract palmately divided at apex, and involucels of several linear bractlets; rays 3 to 8 cm. long; pedicels about 10 mm. long; flowers yellow; fruit elliptical, glabrous, 12 mm.

long, 8 mm. broad, emarginate at base and apex, with wings as broad as body or broader, and inconspicuous dorsal and intermediate ribs; oil tubes usually 2 in the intervals, 6 on the commissural side.

Type locality, "sand cliffs overhanging briny arroyas," San Nicholas Island, California; collected by *Blanche Trask*, April, 1897; type in Herb. Calif. Acad., duplicate in U. S. Nat. Herb.

San Nicholas Island, California.

Specimens examined:

CALIFORNIA: Type specimens as cited under type locality.

60. **CYNOMARATHRUM** Nutt. in Herb.

Calyx teeth evident. Fruit strongly flattened dorsally, oblong. Carpel with sharp or winged dorsal and intermediate ribs and broader winged laterals. Stylopodium flat but evident, in dry specimens appearing spongy. Oil tubes mostly several in the intervals or obscure. Seed dorsally flattened, with plane face.

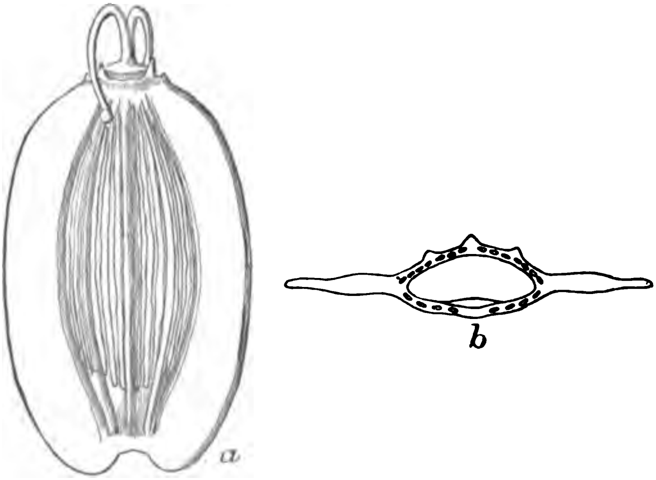


FIG. 63.—Cynomarathrum eastwoodae: *a*, × 6; *b*, × 8.

Acaulescent plants or nearly so, from a stout caudex becoming multicipital and densely clothed with old leaf sheaths, with leaves narrow in outline (the first division pinnate), and yellow (or white?) flowers.

Type species, *Seseli nuttallii* Gray, Proc. Am. Acad. **8**: 287. 1870.

A genus of 6 species belonging to the western plains and mountains.

It seems best to keep out of *Lomatium* the six following species, which have heretofore been placed under *Peucedanum*. They have always appeared anomalous in *Peucedanum* (*Lomatium*), and some of our best botanists have treated the earlier species as very distinct. One of them was considered a generic type by Nuttall, under the name which we have adopted above. Dr. Gray associated it with *Seseli*, while some of the recent collectors have contended that it was not congeneric with our so-called western species of *Peucedanum*. It differs from *Lomatium* in stylopodium-disk, calyx teeth, more winged dorsal and intermediate ribs, and in its very peculiar habit. Its relationships seem to be much nearer *Pteryxia* and *Pseudocymopterus*.

Foliage glabrous.
  Rays and pedicels not very short or reflexed.
    Pedicels 2 to 6 mm. long .... 1. *C. nuttallii.*
    Pedicels 8 to 16 mm. long.
      Fruit linear-oblong, 4 to 7 mm. long .... 2. *C. alpinum.*
      Fruit broader, 10 to 12 mm. long .... 3. *C. parryi.*
  Rays and pedicels very short, reflexed at maturity .... 4. *C. brandegei.*
Foliage very scabrous.
  Pedicels 12 to 18 mm. long; wings about as broad as body ...... 5. *C. eastwoodae.*
  Pedicels 2 to 6 mm. long; wings half as broad as body .... 6. *C. scabrum.*

1. **Cynomarathrum nuttallii** (Gray) C. & R.

Seseli nuttallii Gray, Proc. Am. Acad. **8**: 287. 1870.
Peucedanum graveolens Watson, Bot. King Surv. 128. 1871.
Peucedanum kingii Watson, Proc. Am. Acad. **22**: 474. 1887.
Peucedanum megarrhiza A. Nelson, Bull. Torr. Bot. Club **26**: 130. 1899.

Acaulescent, glabrous; scape 1.5 to 4.5 dm. high, a little exceeding the leaves, arising from a stout caudex becoming multicipital; leaves pinnate or bipinnate; leaflets linear, elongated, cuspidate, sometimes 5 cm. long; umbel somewhat equally 4 to 20-rayed, with involucels of linear-lanceolate bractlets; rays 3 to 3.5 cm. long; pedicels 2 to 6 mm. long; flowers yellow; calyx teeth evident; fruit oblong, 8 to 10 mm. long, 4 mm. broad, narrowly winged, the dorsal and intermediate ribs also sometimes irregularly winged; oil tubes 3 to 5 in the intervals, 6 to 10 on the commissural side; seed somewhat sulcate on the back, with slightly concave face.

Type locality, "Rocky Mountains;" collected by *Nuttall;* type in Herb. Columbia Univ.

Northern Utah, Wyoming, and western Nebraska.

Specimens examined:

UTAH: Wasatch Mountains, altitude 2,700 meters, *Watson* 463, July, 1869; on the Mooseneeah, altitude 2,700 to 3,000 meters, *Ward* 667, 697, June–August, 1875.
WYOMING: Evanston, Uinta County, *Nelson* 2958, May 28, 1897; Point of Rocks, *Nelson* 4769, June 16, 1898 (type of *P. megarrhiza* Nelson).
NEBRASKA: Scotts Bluff, in the pass, *Rydberg* 129, July 22, 1891.

2. **Cynomarathrum alpinum** (Watson) C. & R.

Peucedanum graveolens alpinum Watson, Bot. King Surv. 129. 1871.
Peucedanum kingii alpinum C. & R. Rev. N. Am. Umbell. 71. 1888.

Resembling a dwarf form of *C. nuttallii*, with scapes 1 to 2.5 cm. high; leaves about 7.5 cm. long, mostly simply pinnate, with 3 to 5 pairs of linear and entire leaflets; umbel 3 to 6-rayed, with involucels of narrow bractlets; rays 2.5 to 5 cm. long; pedicels 8 to 12 mm. long; flowers yellow; calyx teeth evident; fruit linear-oblong, 4 to 7 mm. long; oil tubes very obscure, 1 or 2 in the intervals, 4 to 6 on the commissural side.

Type locality, "East Humboldt Mountains, [N.] Nevada," altitude 2,700 meters; collected by *Watson*, no. 464, August, 1868; type in U. S. Nat. Herb.

Mountains of Nevada.

Specimens examined:

NEVADA: Type specimens as cited under type locality; Glencoe, *Jones*, June 30, 1891; Highland Peak, altitude 2,400 to 2,700 meters, *Purpus* 6282, in 1898.

3. Cynomarathrum parryi (Watson) C. & R.

Peucedanum parryi Watson, Proc. Am. Acad. **11**: 143. 1876.
Peucedanum scopulorum Jones, Contr. to Western Botany no. 8: 31. 1898.

Acaulescent, glabrous; stems tufted, their bases clothed with old leaf sheaths; leaves lanceolate in outline, twice pinnate, 1 to 3 dm. long, sometimes longer than the peduncles, pale; pinnæ distant; segments linear and sharp-pointed; rays 5 to 10, nearly equal, 2.5 to 3 cm. long; pedicels slender, 12 to 16 mm. long; involucels of several green rather conspicuous unilateral bractlets usually cleft at apex; fruit glabrous, oblong, 10 to 12 mm. long; lateral wings about as broad as body; calyx teeth evident; oil tubes obscure; flowers apparently yellow.

Type locality, "southern Utah," in the Valley of the Virgin, in the vicinity of St. George, Washington County; collected by *Parry*, no. 85, in 1874; type in Herb. Gray.

Specimens examined:

NEVADA: Charleston Mountains, *C. A. Purpus* 6086, May–October, 1898.
UTAH: Type specimens as cited under type locality; Silver Reef, *Jones* 5449a, May 3, 1894.
CALIFORNIA: Pleasant Canyon, Panamint Mountains, Inyo County, *Jones*, May 6, 1897 (type of *Peucedanum scopulorum* Jones).

Peucedanum parryi has long been made to include certain peculiar species of *Peucedanum* with tufted stems, narrow leaves, prominent calyx teeth, etc. In fact, until recently rediscovered by Mr. Jones, the only specimen of true *P. parryi* was the type collection of which no material is to be found in the U. S. National Herbarium. A recent comparison of the type sheet with a duplicate type of Mr. Jones's *P. scopulorum* convinces us that the two are identical. We have also taken out several forms which have heretofore passed as *P. parryi*. Several flowering specimens are left doubtful, as their generic position can not be decided definitely without fruit.

4. Cynomarathrum brandegei C. & R.

Peucedanum brandegei C. & R. Bot. Gaz. **13**: 210. 1888.

Short caulescent, glabrous, 1 to 4 dm. high, from a thick elongated root; leaves ternately decompound; the ultimate segments lanceolate, 2.5 cm. long, 3 to 6 mm. wide, cuspidate pointed; umbel 6 to 12-rayed, with involucels of few linear or setaceous bractlets; rays 6 to 12 mm. long, pedicels not more than 2 mm., both reflexed at maturity; flowers yellow; calyx teeth evident; fruit oblong, 4 to 5 mm. long, 4 mm. broad, with wings about half as broad as body, and prominent or even slightly winged dorsal and intermediate ribs; oil tubes 2 to 4 in the intervals, 4 or 6 on the commissural side.

Type locality, "Wallawalla region, Washington;" collected by *Brandegee*, no. 799, May, 1883; type in Herb. Coulter.

Eastern Washington.

Specimens examined:

WASHINGTON: Type specimens as cited under type locality; *G. R. Vasey* 296, in 1889; *Sandberg & Leiberg* 516, in 1893; "along Twisp River," *Whited*, July 20, 1896; Bridge Creek, Okanogan County, altitude 1,950 meters, *Elmer* 651, September, 1897; Washington Forest Reserve, *Gorman* 610, August 14, 1897, Mount Stuart, Kittitas County, altitude 1,800 meters, *Elmer* 1116, August, 1898.

5. **Cynomarathrum eastwoodae** C. & R., sp. nov. FIG. 63.

Stems low, much tufted at base; leaves shorter than the peduncles, very narrow in outline, once to twice pinnate, very scabrous; segments short and narrow, apiculate; rays few, nearly equal, 2 to 2.5 cm. long; pedicels 12 to 18 mm. long, usually longer than the fruit; involucels of several linear entire bractlets; fruit glabrous, oblong, 8 to 10 mm. long, with wings nearly as broad as body; calyx teeth evident.

Type locality, Grand Junction, Colorado; collected by *Alice Eastwood*, May, 1892; type in U. S. Nat. Herb.

Colorado.

Specimens examined:

COLORADO: Type specimens as cited under type locality; same station, *Alice Eastwood*, May 18, 1891; same station, *E. Bethel*, June 20, 1898; low plains, Mesa County, *H. C. Long*, in 1893.

6. **Cynomarathrum scabrum** C. & R., sp. nov.

Acaulescent; stems tufted, their bases clothed with old leaf sheaths; leaves very scabrous, narrowly lanceolate in outline, bipinnate; ultimate segments short ovate and apiculate; peduncles 1 to 2 dm. long; involucels of small linear setaceous bractlets somewhat scarious and united at base; rays 1 to 3.5 cm. long; pedicels 2 to 6 mm. long; flowers probably yellow; calyx teeth evident; fruit oblong, glabrous, 7 to 9 mm. long, 4 to 6 mm. broad, with wings half as broad as body, and filiform dorsal and intermediate ribs stronger at base and apex; oil tubes 3 to 5 in the intervals, small, 4 to 10 on the commissural side.

Type locality, Frisco, Utah, altitude 2,400 meters; collected by *Marcus E. Jones*, no. 1864, June 22, 1880; type in U. S. Nat. Herb.

Only known from type locality.

Specimens examined:

UTAH: Type specimens as cited under type locality.

This species was first distributed as *Peucedanum nevadense*, and afterwards confused with *P. parryi*, from which it differs in its scabrous foliage, broader leaf segments, etc.

61. HERACLEUM L. Sp. Pl. 1: 249. 1753.

Calyx teeth small or obsolete. Fruit broadly obovate, very much flattened dorsally, somewhat pubescent. Carpel with dorsal and intermediate ribs filiform: the broad lateral wings contiguous to those of the other carpel, strongly nerved toward the outer margin; strengthening cells continuous about seed cavity and under the nerves. Stylopodium thick conical. Oil tubes solitary in the intervals, conspicuous, about half as long as the carpel, 2 to 4 on the commissural side. Seed very much flattened dorsally.

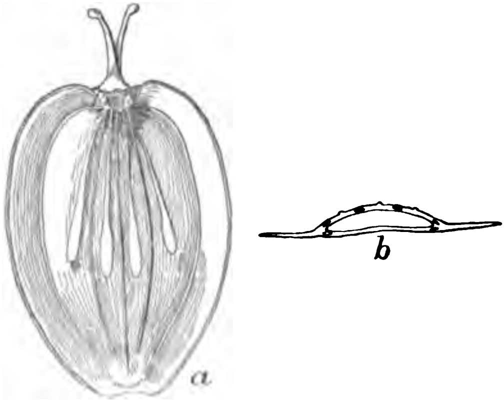


FIG. 64.—Heracleum lanatum: *a*, *b*, × 4.

Tall stout perennials, with large ternately compound leaves, deciduous involucres, involucels of numerous bractlets, large many-rayed umbel of white flowers, and obcordate petals (the outer ones often dilated and 2-cleft).

First species cited, *Heracleum sphondylium* L.

A genus of about 60 species, belonging to the northern hemisphere, represented in North America by a single species.

1. **Heracleum lanatum** Michx. Fl. Bor. Am. 1: 166. 1803. FIG. 64.

Very stout, 12 to 24 dm. high, pubescent or woolly above; petioles much dilated; leaflets petiolulate, round-cordate, 10 to 25 cm. broad, irregularly cut-toothed; rays 5 to 15 cm. long; fruit 8 to 12 mm. long, somewhat pubescent.

Type locality, "Canada."

Wet ground, from Canada to North Carolina and Tennessee, and extending westward to New Mexico, California, and Alaska.

Specimens examined: We cite but few of the numerous sheets examined of this abundant and widespread species.

VERMONT: Peacham, *Alice Stevens*, August 5, 1892.

MASSACHUSETTS: Ipswich, *Oakes*.

CONNECTICUT: Fairfield, *Eames*, June 14, 1894.

NEW YORK: Ithaca, *Univ. Coll.*, June, 1875.

PENNSYLVANIA: Lancaster, *Small*, June 4, 1889.

NORTH CAROLINA: Roan Mountain, altitude 1,800 meters, *Merriam*, September 1, 1892.

TENNESSEE: Cocke County, *Kearney* 707, August 28, 1897.

OHIO: Lancaster, *Bigelow*.

IOWA: Grinnell, *Jones*, June 19, 1877.

SOUTH DAKOTA: Black Hills, *Rydberg*, altitude 1,200 meters, June 28, 1892.

NEBRASKA: Newcastle, *Clements*, in 1893.

COLORADO: Mancos, *Baker, Earle, & Tracy* 580, July 9, 1898.

WYOMING: National Park, *Knowlton*, July 11, 1888.
MONTANA: Near Red Lodge, *Rose*, July 26, 1893.
IDAHO: Nez Perces County, *Sandberg*, May 27, 1892.
UTAH: Wasatch Mountains, altitude 1,800 meters, *Watson* 471, July, 1869.
NEVADA: Northern Nevada, *Watson*, in 1868.
CALIFORNIA: Tulare County, *Coville & Funston* 1368, July 29, 1891; Siskiyou County *Palmer* 2544, July, 1892.
OREGON: Near Fort Klamath, altitude 1,470 meters, *Leiberg* 674, August 7, 1894.
WASHINGTON: Spokane River, *Wilkes Exped.* 397.
ALASKA: Yes Bay, *Howell* 1760, July 16, 1895; Bering Island, *James Macoun*, September 1, 1891; Yakutat Bay and Kadiak Island, *Trelease* 4522, 4523, 4524, June 19–July 20, 1899; Tongass village, *Brewer & Coe* 593, July 26, 1899.

For description of introduced species, see page 256.

62. **DAUCUS** L. Sp. Pl. 1: 242. 1753.

Calyx teeth obsolete. Fruit oblong, flattened dorsally. Carpel with 5 slender bristly primary ribs, and 4 winged secondary ones each bearing a single row of prominent barbed prickles. Stylopodium depressed or wanting. Oil tubes solitary in the intervals (that is, under the secondary ribs), 2 on the commissural side. Seed flattened dorsally; the face somewhat concave or almost plane.

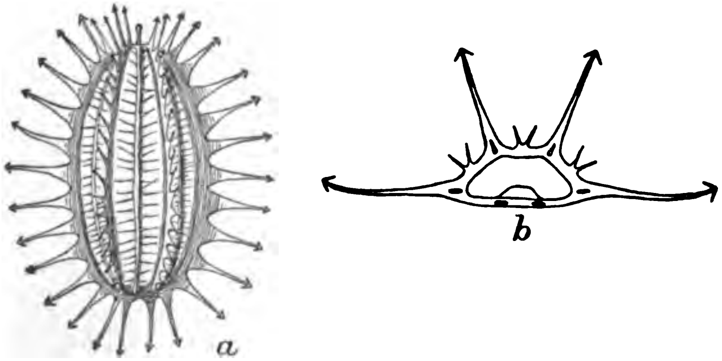


FIG. 65.—Daucus pusillus: *a*, *b*, × 8.

Bristly annuals or biennials, with pinnately decompound leaves, foliaceous and cleft involucral bracts, involucels of entire or toothed bractlets, and usually white flowers in concave umbels (connivent in fruit).

First species cited, *Daucus carota* L.

A genus of about 60 species, of wide distribution, chiefly displayed in the Mediterranean region, and represented in our flora by a single wide-ranging species.

1. **Daucus pusillus** Michx. Fl. Bor. Am. 1: 164. 1803. FIG. 65.

Stems prevailingly simple, papillate hispid, from 2.5 to 60 cm. high; leaves finely dissected into narrowly linear segments; umbels unequally few to many-rayed, forming a rather compact head; rays 1 to 3.5 cm.

long; pedicels very unequal, from 16 mm. long to almost wanting; fruit 3 to 5 mm. long.

Type locality, "in campestribus Carolinae."

From the Carolinas and Florida to California, thence northward to Vancouver Island.

Specimens examined:

South Carolina: Columbia, *Taylor*.

Florida: Near Jacksonville, *Curtiss* 4343, 4756, May–June, 1893 and 1894.

Mississippi: Point St. Martin, *Tracy*, May 15, 1898.

Missouri: Eagle Rock, *Bush*, June 22, 1897.

Indian Territory: *Sheldon*, June 19, 1891.

Arkansas: Fort Smith, *Bigelow*, in 1853–54; northwestern Arkansas, *Harvey*.

Texas: Western Texas, *Wright* 1386, in 1852; Gillespie County, *Jermy* 478; near Eagle Pass, *Havard*, May, 1883; Fort Worth, *Dewey*, June 8, 1891; Nueces County, *Heller* 1438, April, 1894; San Antonio, *Marlatt*, May, 1896.

New Mexico: Grant County, *Mearns* 40, May 3, 1892.

Arizona: Yucca, *Jones*, May 17, 1884; Tucson, *Myrtle Zuck*, May 16, 1896.

California: Monterey, *Parry*, in 1850; *Bigelow*, in 1853–54; Borax Lake, *Torrey* 161, in 1865; Santa Cruz, *Jones* 2319, June 30, 1881; Kern County, altitude 1,000 meters, *Coville & Funston* 1114, June 25, 1891; Marin County, *Palmer* 2306, June, 1892; Amador County, *Hansen* 1765, June 25, 1896; Santa Catalina and San Nicholas islands, *Blanche Trask*, March–April, 1897; Mendocino County, *Brown* 738, May, 1898.

Oregon: *Wilkes Exped.*

Washington: Klickitat County, *Suksdorf*, June, 1881; San Juan County, *Henderson*, July 3, 1892; Kitsap County, *Piper*, July 15, 1895.

British Columbia: Near Nanaimo, Vancouver Island, *Macoun* 308, July 14, 1893.

For description of introduced species, see page 256.

INTRODUCED GENERA AND SPECIES.

1. **HYDROCOTYLE** L. Sp. Pl. **1**: 234. 1753.—For description of genus and native species, see page 25.

Hydrocotyle bonariensis Lam. Encycl. **3**: 153. 1789. Although seeming well established in many places in the South, this species is generally considered as an introduction from South America. It is often reported from ballast heaps in the South.

2. **ERYNGIUM** L. Sp. Pl. **1**: 232. 1753.—For description of genus and native species, see page 42.

Eryngium campestre L. Sp. Pl. **1** : 233. 1753, a European species, was found on ballast grounds of Maryland, at Baltimore, by *Katherine A. Taylor*, and at Canton by *B. Sollers*, both in 1891, and again at Baltimore in 1898 by *C. C. Plitt*.

Eryngium foetidum L. Sp. Pl. **1** : 232. 1753, a West Indian species, was reported by Michaux as having been found by him in dry fields in Florida, and was said by Pursh to occur in Georgia and Florida, but never having been found subsequently it should probably be excluded from the flora of the United States.

Eryngium nasturtiifolium Juss. in Delar. Eryng. 46. pl. 17. 1808, a Mexican species, was found by *G. C. Nealley* at Santa Maria, Texas, in 1889.

Eryngium planum L. Sp. Pl. **1** : 233. 1753, a European species, was collected in 1899 by *E. S. Steele*, growing spontaneously on a terrace along Massachusetts avenue, Washington, D. C.

Eryngium divaricatum H. & A. in Hook. Bot. Misc. **3**: 350. 1833. From time to time for the last several years an *Eryngium* has been reported from the Southern States differing from any native species as well as from all material in the National

Herbarium. It was suspected to be an introduced species and was therefore forwarded to Mr. W. Botting Hemsley at Kew, who has recently given much attention to this genus. While reading page proof the following report is received from him: "The introduced *Eryngium* is *E. flaccidum* H. & A. which I think is not specifically different from their *E. divaricatum.*" We have material from Wilmington, N. C., and Pensacola, Fla. (*Curtiss*).

3. **CHAEROPHYLLUM** L. Sp. Pl. **1**: 258. 1753.—For description of genus and native species, see page 58.

CHAEROPHYLLUM TEMULUM L. Sp. Pl. **1**: 258. 1753, an Old World species, was found by *Martindale* on ballast near Philadelphia, in 1878, and distributed as *C. sylvestre* L.

CHAEROPHYLLUM BULBOSUM L. Sp. Pl. **1**: 258. 1753, a European species, was collected in 1899 by *E. S. Steele* near the fish ponds, Washington, D. C., where it seems to be spreading.

4. **ANTHRISCUS** Bernh. Syst. Verz. Erf. 113. 1800.—A genus resembling *Chaerophyllum* in general habit, but the beaked fruit is without ribs, and there are no oil tubes or strengthening cells. An Old World genus containing about 13 species, represented in our flora by two naturalized species and one waif.

Fruit glabrous.
  Foliage coarse; fruit with short beak .... *A. silvestris.*
  Foliage much dissected; fruit with long beak .... *A. cerefolium.*
Fruit bristly pubescent .... *A. anthriscus.*

ANTHRISCUS SILVESTRIS (L.) Hoffm. Gen. Umbell. 40. 1814. A waif on Staten Island, N. Y.; collected at New Dorp by *Britton*, June 11, 1895; at same station, by *Tyler*, June 29, 1897. The specimens referred to this species in our former *Revision* prove to be *Chaerophyllum temulum* L.

ANTHRISCUS CEREFOLIUM (L.) Hoffm. Gen. Umbell. 41. 1814. Naturalized in eastern and southern Pennsylvania; collected at Lancaster and Bethlehem by *Porter* in 1861 and 1890, and at Lancaster by *Small;* also collected at Columbia, S. C., by *Miss K. A. Taylor*, April 26, 1888; and in Grand River Valley, Oreg., by *Cusick* (no. 1760*a*), in 1897.

ANTHRISCUS ANTHRISCUS (L.) Karst. Deutsch. Fl. 857. 1880–1883 (*A. vulgaris* Pers.), the common "bur chervil" of Europe, seems to be naturalized as a weed in the streets of Alameda, Cal., having been collected by *Lemmon* and by *Dr. Gibbs* in 1889; also found as a waif in Nova Scotia by *Macoun.*

5. **SCANDIX** L. Sp. Pl. **1**: 256. 1753.—A genus which differs from *Anthriscus* in its ribbed fruit, which extends into a conspicuous beak much longer than the body. An Old World genus containing about 10 species, and represented in our flora by a single species, which seems to be naturalized in some localities.

SCANDIX PECTEN-VENERIS L. l. c., the "shepherd's needle" or "Venus-comb" of Europe and Western Asia, is naturalized in Napa Valley, California, where it has been collected by *Sonne.* Found also at Brighton, N. J., by *Britton*, July 21, 1888; in Passaic County, N. J., by *Nash*, May 22, 1891; near Washington, D. C., by *Kearney*, June 4, 1898, and at Statesville, N. C., by *Hyams*, June, 1878.

6. **TORILIS** Adans. Fam. **2**: 99. 1763.—A genus which differs from *Caucalis* in its sulcate rather than involute seed face, and its fruit covered with strong spines (rather than in definite rows between the ribs). A genus of the Eastern Hemisphere, containing about 23 species, most of which are in the general Mediterranean region. The two following species have become naturalized within our range:

Umbels opposite the leaves, sessile, or on short peduncles; leaves finely dissected. *T. nodosa.*
Umbels terminal or axillary, on slender peduncles; leaves not finely dissected. *T. anthriscus.*

TORILIS NODOSA (L.) Gaertn. Fruct. **1**: 82. pl. 20. f. 6. 1788 (*Tordylium nodosum* L.; *Caucalis nodosa* Scop.), a native of Europe and northern Africa, has been introduced into Chile and Peru, and thence introduced and naturalized in California, from whence our specimens have been collected as follows: Near San Francisco, *Jones* 3265, May 16, 1882; near Chico, Butte County, *Palmer* 2073, June 7–12, 1892; same station, *Mrs. R. M. Austin* 684, May, 1896; Amador County, *Hansen* 1713, June 7, 1896; near Clear Creek, Butte County, *Brown* 192, April 1–15, 1897; Santa Lucia Mountains, Monterey County, *Plaskett*, April, 1898. Collected also in Texas by *Hall* (no. 259), near Austin, May 16, 1872, and apparently naturalized; also on ballast ground at Port Eads (*Langlois*), Baltimore (*Foreman* in 1876), and Philadelphia (*Martindale*); and reported from Ames, Iowa (*Burgess*).

TORILIS ANTHRISCUS (L.) Gmel. Fl. Bad. **1**: 615. 1805 (*Tordylium anthriscus* L.; *Caucalis anthriscus* Huds.), a European species, seems to be naturalized near Buffalo, N. Y. (*Clinton*), Cincinnati, Ohio (*Lloyd* in 1879), and Painesville, Ohio (*Werner*). It is reported also from ballast at Baltimore (*Sollers* in 1890), and from dumps near Washington, D. C. (*Miss Dorsey* in 1894).

7. **CAUCALIS** L. Sp. Pl. **1**: 240. 1753.—For description of the genus and native species, see page 69.

CAUCALIS LATIFOLIA L. Syst. Nat. ed. 12. **2**: 205. 1767, a species of Europe and temperate Asia, with umbels on slender peduncles, and large spiny fruit, has been collected on ballast near Philadelphia (*Martindale* in 1877).

8. **CORIANDRUM** L. Sp. Pl. **1**: 256. 1753.—A genus resembling *Bifora* in general habit, but the fruit is globose and not at all constricted at the commissure. An Old World genus of two species, represented in our flora by the following garden form.

CORIANDRUM SATIVUM L. l. c., the common coriander of the eastern Mediterranean region, has frequently escaped from cultivation, and is probably established. Our specimens are as follows: Statesville, N. C., *Hyams*, in 1879; Marthas Vineyard, *Burgess*, in 1893; Brookings, S. Dak., *Williams*, in 1893; Unionville Valley, Nevada, *Watson* in 1868; Los Angeles, Cal., *Hasse*, in 1888. Collected also on ballast at Philadelphia (*Martindale*) and Portland, Oreg. (*Henderson*).

9. **BIFORA** Hoffm. Umb. Gen. ed. 2. 191. 1816.—For description of the genus and native species, see page 70.

BIFORA RADIANS Bieb. Fl. Taur. Cauc. Suppl. 233. 1819, a species of the Mediterranean region, was collected on ballast near Philadelphia (*Martindale*) and Providence (*Bennett*), but has not been reported since.

10. **CONIUM** L. Sp. Pl. **1**: 243. 1753.—A genus of poisonous biennials, with spotted stems, large decompound leaves with lanceolate pinnatifid leaflets, involucre and involucels of narrow bracts, white flowers, and ovate glabrous fruit with prominent wavy ribs and no oil tubes.

CONIUM MACULATUM L. l. c., a large branching European species, and the type of the genus, is naturalized in waste places throughout the Northeastern States and Canada; also found in California. Our material is as follows: Ontario, *Macoun* 4973, August 18, 1894; Manchester, Vt., *M. A. Day* in 1898; Ithaca, N. Y., *McCarthy*, *Rowlee*; Lancaster, Pa., *Small*, June, 1893; San Francisco, Cal., *Kellogg & Harford* 303, June 12, 1868; near Chico, Butte County, Cal., *Palmer* 2093, June 7–12, 1892; Truckee, Cal., *Sonne* 5, July, 1892; Sacramento River, California, *Mrs. Austin* 270.

11. **BUPLEURUM** L. Sp. Pl. **1**: 236. 1753.—For description of the genus and native species see page 84.

BUPLEURUM ROTUNDIFOLIUM L. Sp. Pl. **1**: 236. 1753, with ovate perfoliate leaves, is introduced from Europe, and is common in fields and cultivated ground, from New Hampshire to North Carolina, and westward to South Dakota, Missouri, and Arizona. Our material is as follows: Lancaster County, Pa., *Carter*, in 1864; Capitol View, Md.,

Miller, in 1898; Shenandoah Valley, Virginia, *Ward*, in 1891; Chapel Hill, N. C., *Ashe;* Rowan County, N. C., *Small & Heller* 62, in 1891; near Nashville, Tenn., *Gattinger;* near Knoxville, Tenn., *Scribner*, in 1890; same station, *Ruth*, in 1895 and 1898; Brookings, S. Dak., *Williams*, in 1893; Clay County, Mo., *Mackenzie*, in 1897; Tucson, Ariz., *Toumey*, in 1892.

BUPLEURUM PROTRACTUM Hoffmgg. & Link, Fl. Port. **2**: 387. 1820 (?), from the Mediterranean region, which differs from *B. rotundifolium* chiefly in its tuberculate fruit, was collected on ballast ground near Philadelphia by *Martindale*, but has not been reported since.

BUPLEURUM ODONTITES L. Sp. Pl. **1**: 237. 1753, from Europe, to be recognized by its linear-lanceolate leaves, is reported by *Deane* as introduced in Massachusetts.

12. **CUMINUM** L. Sp. Pl. **1**: 254. 1753.—A genus which differs from *Trepocarpus* in its rose-colored flowers and bristly fruit. A monotypic genus of the Mediterranean region.

CUMINUM CYMINUM L. l. c., the common "cumin" of the Orient, was found at El Paso, Tex., by *Wright* in 1852, and along the banks of the Rio Grande near El Paso by *Lemmon* in 1881. It is a small slender annual 7.5 to 25 cm. high, with long filiform leaflets and similar involucre and involucels.

13. **APIUM** L. Sp. Pl. **1**: 264. 1753.—For description of the genus and native species see page 86.

Pinnate leaves with 1 or 2 pairs of broadly cuneate-obovate or rhomboidal lobed and toothed leaflets .... *A. graveolens.*
Pinnate leaves with oblong and serrate leaflets .... *A. nodiflorum.*

APIUM GRAVEOLENS L. Sp. Pl. **1**: 264. 1753, the common garden celery, is a native of the coasts of Europe, but has become widely naturalized, especially in the salt marshes of southern California. Our material is as follows: Duncans Mills, Cal., *Jones* 3604, in 1882; near San Diego, Cal., *Orcutt* 1299, in 1884; near Los Angeles, Cal., *Tracy*, in 1887; near Phoenix, Ariz., *Dewey*, in 1891; also collected on ballast near Philadelphia (*Martindale*).

APIUM NODIFLORUM (L.) Reichb. f. Ic. Fl. Germ. **21**: 10. 1867 (*Sium nodiflorum* L.), a native of Europe, was reported by *Walter* as abundant near Charleston, S. C., but was not afterwards reported until specimens were obtained by *Mellichamp;* also found on ballast near Philadelphia (*Martindale*).

APIUM REPENS (L.) Reichb. f. Ic. Fl. Ger. **21**: 10. 1867 (*Sium repens* L.), a European species, was found on ballast near Philadelphia by *Martindale*, but has not been reported since.

14. **PETROSELINUM** Hoffm. Gen. Umb. 78. 1814.—A genus which differs from *Apium* and *Carum* in its yellow or greenish-yellow flowers, and kept distinct from both by Drude. A genus of Europe and the Mediterranean region, containing 5 species.

PETROSELINUM PETROSELINUM (L.) Karsten Deutsch. Fl. 831. 1880–1883 (*Apium petroselinum* L.; *Carum petroselinum* Benth. & Hook.), the cultivated parsley, a native of the Mediterranean region, has become naturalized in several places. Our material is as follows: Anne Arundel County, Md., *J. Donnell Smith*, in 1878; Iowa, *Miss C. Harrison*, in 1889; San Antonio, Tex., *Heller* 1838, in 1894; Garnett, Lincoln County, Ark., *E. N. Plank;* also reported by *Macoun* as spontaneous in Canada.

15. **AMMI** L. Sp. Pl. **1**: 243. 1753.—A genus which suggests *Daucus* in its inflorescence, but with very different fruit. A genus of Europe and Africa, containing 7 species, 2 of which have been found occasionally in our flora.

Inflorescence open in fruit... *A. majus.*
Inflorescence incurved in fruit, forming a compact cluster............... *A. visnaga.*

AMMI MAJUS L. l. c. was reported by De Candolle (Prodr. **4**: 112) as found in

Newfoundland by Pylaie, but has not been discovered since. It has also been collected on ballast near Philadelphia by *Martindale* and *Parker*.

AMMI VISNAGA (L.) Lam. Fl. Fr. **3**: 462. 1778 (*Daucus visnaga* L. Sp. Pl. **1**: 242. 1753), from the Mediterranean region, has been collected on ballast near Philadelphia (*Martindale* in 1879), and near Portland, Oreg. (*Henderson* in 1887).

16. **CARUM** L. Sp. Pl. **1**: 263. 1753.—For description of genus and native species, see page 103.

CARUM CARUI L. Sp. Pl. **1**: 263. 1753, the common garden caraway from Europe, and the type of the genus, has become naturalized in many places, especially in the north and northwest. It may be recognized by its pinnately compound leaves with very narrow and often filiform entire or toothed divisions. Our material is as follows: Newfoundland (*Osborn* in 1879); Jeffrey, N. H. (*Deane* in 1889 and 1890); Manchester, Vt. (*M. A. Day* in 1898); Easton, Conn. (*Eames* in 1895); Norfolk, Va. (*Ward* in 1877); Ithaca, N. Y. (*Univ. Coll.* in 1880); Westmoreland County, Pa. (*Pierron* in 1877); Lebanon County, Pa. (*Heller & Small* in 1891); Monroe County, Pa. (*Britton* in 1893); Lorain County, Ohio, (*Ricksecker* in 1895); Naperville, Ill. (*Umbach* in 1898); Dakota County, Minn. (*Mearns* in 1891); Black Hills, S. Dak. (*Rydberg* in 1892); Brookings, S. Dak. (*Thornber* in 1893); Fort Collins, Colo. (*Cowen* in 1893).

17. **PIMPINELLA** L. Sp. Pl. **1**: 263. 1753.—A genus which differs from *Taenidia* in its pinnate leaves, conical stylopodium, almost obsolete ribs, and white flowers. A widely distributed genus of the Old World, containing about 70 species.

PIMPINELLA SAXIFRAGA L. Sp. Pl. **1**: 263. 1753, a European species, and type of the genus, has been somewhat widely introduced. Our material is as follows: New Brunswick, *John Britton*, August 30, 1890; roadsides near Easton, Pa., *Porter*, July 30, 1895; Sycamore, Ohio, *Rushy* in 1878. It may be distinguished by its broad leaflets.

PIMPINELLA ANISUM L. Sp. Pl. **1**: 264. 1753, the cultivated anise from the eastern Mediterranean, is reported by *Deane* as occurring wild in Massachusetts. It may be known by its very narrow and shining leaf segments.

18. **AEGOPODIUM** L. Sp. Pl. **1**: 265. 1753.—A genus which differs from *Pimpinella* in its ternate leaves, large ovate leaflets, and absence of oil tubes. A genus of Europe-Siberia, containing 2 species.

AEGOPODIUM PODAGRARIA L. l. c., a troublesome weed in Europe and Siberia, is sparingly introduced. Our material is as follows: Watertown, Mass. (*Deane* in 1894); Cambridge, Mass. (*Robinson* in 1895); Rohrerstown, Pa. (*Small* in 1890). We have also had it from near Woodside, Long Island (*Brown* in 1877); Newark, Del. (*Commons*); and Providence, R. I. (*Bailey*).

19. **OENANTHE** L. Sp. Pl. **1**: 254. 1753.—For description of genus and native species see page 121.

OENANTHE PHELLANDRIUM Lam. Fl. Fr. **3**: 432. 1778, a species of Europe and northern Asia, was found by *E. S. Steele*, June 10, 1897, near fish ponds on the grounds of the Washington Monument. It may be recognized by its fibrous roots (with no rootstock as in our native species), and rather small finely dissected leaves.

20. **AETHUSA** L. Sp. Pl. **1**: 256. 1753.—A genus which resembles *Apium* and *Petroselinum*, but differs in its more finely divided leaves, globose-ovoid fruit (not flattened either way), and prominent thick and sharp ribs. A monotypic genus of Europe and Asia.

AETHUSA CYNAPIUM L. l. c., a fetid poisonous herb known as the "fool's parsley" or "dog's parsley," has become rather widely introduced in waste and cultivated ground. Our material is as follows: Ipswich, Mass. (*Oakes; Morong* in 1875); ballast near Camden, N. J. (*Martindale* in 1878); Tinicum, Delaware County, Pa. (*Porter* in 1899). Reported also at various stations from Nova Scotia and New England to Minnesota.

21. **FOENICULUM** Adans. Fam. Pl. **2**: 101. 1763.—A genus of stout and glabrous aromatic herbs, with leaves (often large) dissected into numerous filiform segments, no involucre or involucels, large umbels of yellow flowers, oblong glabrous fruit terete or nearly so and with prominent ribs, and solitary oil tubes. An Old World genus containing about 4 species.

Foeniculum foeniculum (L.) Karst. Deutsch. Fl. 837. 1880–1883 (*Anethum foeniculum* L. Sp. Pl. **1**: 263. 1753; *Foeniculum vulgare* Graetn. Fruct. & Sem. **1**: 105. pl. 23. fig. 5. 1788), the common cultivated fennel from Europe, has become naturalized in waste ground. Our material is as follows: Weehawken, N. J. (*Van Sickle*); Guttenberg, N. J. (*Van Sickle* in 1894); Delaware County, Pa.; Fortress Monroe, Va. (*Chickering* in 1884); Hampton, Va. (*Steele* in 1895); Statesville, N. C. (*Hyams* in 1878); Knox County, Tenn. (*Ruth* in 1898); Texas (*Nealley* in 1883); Dorsey, Nebr. (*Clements* in 1893); Los Angeles, Cal. (*Hasse* in 1888 and 1890); Santa Catalina Island, Cal. (*Blanche Trask* in 1896).

22. **ANETHUM** L. Sp. Pl. **1**: 263. 1753.—A genus with the habit of *Foeniculum*, and fennel-like leaves, but with the fruit of a *Peucedanum* with narrow lateral wings. A genus of 2 species, indigenous in the Orient.

Anethum graveolens L. Sp. Pl. **1**: 263. 1753 (*Peucedanum graveolens* Benth. & Hook. Gen. Pl. **1**: 919. 1867), the cultivated anise or dill, has escaped from cultivation and become established in waste places at Wilmington, Del. (*Tatnall*), in waste ground about Chicago, Ill. (*Umbach* in 1897), at Los Angeles, Cal. (*Hasse* in 1889), at Wandotte, Ark. (*Plank*), and probably at other places.

23. **LEVISTICUM** Koch, Nov. Act. Caes. Leop. Acad. **12**: 101. 1824.—A genus resembling *Ligusticum*, but differing in the fruit flattened dorsally and ribbed as in *Angelica*, and in its yellow or greenish-yellow flowers. A monotypic genus of southern Europe.

Levisticum levisticum (L.) Karst. Deutsch. Fl. 844. 1880–1883 (*Ligusticum levisticum* L. Sp. Pl. **1**: 250. 1753; *Levisticum officinale* Koch, l. c.), to be recognized by its large ternate-pinnate leaves with broad thickish and veiny more or less cuneate leaflets toothed or lobed above, has become introduced in several places. Our material is from Enfield (Tompkins County), N. Y. (*Coville* in 1884), and Shelburn, Vt. (*Mrs. Nellie F. Flynn* in 1899). It is also reported by *Deane* from Connecticut.

24. **IMPERATORIA** L. Sp. Pl. **1**: 259. 1753.—A genus of tall plants, perhaps most closely related to *Angelica*, but our species differing in its once ternate leaves with very broad and stalked segments which are often 3-parted nearly or quite to the base, the fruit resembling small fruits of *Angelica*. A genus containing about 10 species, natives of the Old World. Bentham & Hooker, followed by Drude, have merged this genus with *Peucedanum*.

Imperatoria ostruthium L. Sp. Pl. **1**: 259. 1753, a native of Europe, and the type of the genus, has been reported as introduced in Newfoundland, New York, Pennsylvania, and Michigan. Our single sheet is from Lyons, Mich. (*Dr. R. P. De Vore* in 1892).

25. **PASTINACA** L. Sp. Pl. **1**: 262. 1753.—A genus of stout plants, resembling *Heracleum* in fruit characters, but with pinnately compound leaves and yellow flowers. A genus containing about 14 species, natives of Europe and Asia.

Pastinaca sativa L. Sp. Pl. **1**: 262. 1753, the common parsnip, a native of Europe and the type species of the genus, has become a very common weed in North America. The following citations of a very few of the specimens examined may serve to indicate its range: Kingston, Ontario (*Fowler* in 1895); Manchester, Vt. (*Day* in 1898); Great Barrington, Mass. (*Pollard* in 1893); Greens Farms, Conn. (*Pollard* in 1894); Ithaca, N. Y. (*Univ. Coll.* in 1875); Lancaster County, Pa. (*Small* in 1890); Youngstown, Ohio (*Ingraham* in 1891); Naperville, Ill. (*Umbach* in 1897); Fort Snelling, Minn. (*Mearns* in 1896); Black Hills, S. Dak. (*Rydberg* in 1892); Newcastle, Nebr. (*Clements* in 1893); Helena, Mont. (*Kelsey* in 1888); Buena Vista, Colo. (*Crandall* in 1897); Provo, Utah (*Jones* in 1894); Nevada (*Watson* in 1868); Siskiyou County, Cal. (*Palmer* in 1892); Pierce County, Wash. (*Piper* in 1889).

26. **HERACLEUM** L. Sp. Pl. 1: 249. 1753.—For description of genus and native species see page 248.

HERACLEUM SPHONDYLIUM L. Sp. Pl. 1 : 249. 1753, a native of Europe, and the first species cited under the genus, has been found on ballast near New York City by *Addison Brown.*

27. **DAUCUS** L. Sp. Pl. 1 : 242. 1753.—For description of genus and native species see page 249.

DAUCUS CAROTA L. Sp. Pl. 1 : 242. 1753, the original of the cultivated carrot, and a native of Europe and Asia, has become exceedingly common in North America, often being one of the most troublesome weeds. As contrasted with *D. pusillus* it may be recognized by its much more robust habit, broader leaf segments, and much larger umbels. It is needless to cite the specimens examined, as they come from every part of the United States, especially the northern portion. The flowers are usually white, with the central one of each umbel purple, but in specimens from Ithaca, N. Y. (*Rowlee* in 1891), the whole umbel is a bright canary yellow, while near Washington, D. C. (*Ward* in 1877 and *Mearns* in 1897) there occur forms with all the flowers of the umbel purple. A rose-colored form is reported by Millspaugh as common in West Virginia and published by him as "forma rosea" in West Va. Agr. Exp. Station Bull. 24: 369. 1892.

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[Synonyms are printed in _italics;_ introduced genera and species are indicated by an asterisk.]

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U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF BOTANY.

CONTRIBUTIONS

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THE ORIGIN AND DISTRIBUTION OF THE COCOA PALM.

BY

O. F. COOK.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., June 12, 1901.

SIR: I have the honor to transmit herewith a manuscript entitled, The Origin and Distribution of the Cocoa Palm, by Mr. O. F. Cook, Special Agent for Tropical Agriculture, which I recommend for publication as Contributions from the United States National Herbarium, Volume VII, No. 2.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. JAMES WILSON,
Secretary of Agriculture.

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THE ORIGIN AND DISTRIBUTION OF THE COCOA PALM.

INTRODUCTORY.

Few groups of plants as widely distributed as the palms have their species, genera, and even families so strictly limited geographically. A large proportion of the genera are monotypic, and many of the species are confined to small islands or localized in equally circumscribed continental areas. Thus, not only are all the species and genera of American palms different from those of Asia, but several genera are peculiar to the intervening islands of the Pacific, though most of these are of Asiatic rather than of American affinities. To the above rule the generally credited Asiatic or Malayan origin of the cocoa palm has furnished the single exception, all of its relatives being American. Curiosity regarding the nature of the evidence by which such an anomaly of distribution could be established and explained has led, first, to a review of the data relating to the long known, though frequently forgotten, fact that the cocoanut was in America before the discovery of this continent by Europeans; and, second, to a belief that the supposed proof of the extra-American origin of the cocoanut is not only inadequate, but that the theory of such an origin is incompatible with numerous collateral facts.

In attempting to present an alternative view a remarkable amount of traditional error and confusion has been encountered; indeed, a thorough examination and elucidation of the misconceptions which have grown up about this question would require far more time and space than the discussion of gratuitous errors can ever deserve. And yet many of the points involved are of interest and importance outside the immediate problem, in that they relate to facts and inferences bearing upon all similar discussions, in which systematic biology and ecology are combined with anthropology, philology, history, and tradition. Finally, an immediate justification of a somewhat detailed discussion of the origin of the cocoa palm is to be found in the fact that it furnishes a not unfair example of the treatment which similar questions have received at the hands of De Candolle and others whose opinions are commonly cited with confidence by both botanists and anthropologists. Thus the evidence of the existence of the banana in prehistoric America is equal, if not superior, to that here presented for the cocoanut. The banana and the sweet potato, both grown in cultivation only from cuttings, crossed the Pacific before the advent of Europeans; and this fact, not to mention here others of similar import, goes far to render probable the human distribution of the cocoa palm. At the same time it tends to demonstrate that the prehistoric trans-Pacific communication, of which evidence is now being sought with great diligence and expense in Alaska and Kamchatka, took place within the Tropics. An ecological investigation of the peoples of the shores and islands of the Pacific, giving special attention to the species and varieties of their food plants, might be undertaken with reasonable prospects of decisive results upon many questions now approached only by theory and conjecture, and upon which little light can be expected from the tribes of the polar regions, who long since left behind them, not only their tropical economic plants, but all the agricultural arts and habits which their remote ancestors may have possessed.

Owing to the great antiquity of the beginnings of agriculture the origins of many cultivated plants are involved in obscurity. A considerable proportion of our most important economic species are not known in their wild state, presumably because human selection has rendered their botanical relationships unrecognizable, or because the original wild forms have become extinct. Even in dealing with the origins of the temperate plants cultivated in the Mediterranean region there are many unsolved problems, notwithstanding the great amount of historical and philological testimony available, and it is thus only reasonable to expect that the confusion and uncertainty will be many times greater with the species domesticated in primitive tropical societies the existence and location of which are often little more than conjectural. Moreover, in the absence of formal records or historical remains, the plants themselves may prove to be the best obtainable clew to the locations and movements of prehistoric agricultural peoples. While in such matters we may not soon, if ever, attain to satisfactory definiteness and certainty, it is the more necessary to use every fact drawn from general biology or from other collateral sources as a view point from which less satisfactory evidence may be interpreted. Pickering was undoubtedly correct in believing that useful plants furnish man's best record of his own primitive existence. Unfortunately, that author, so zealous in collecting materials, did not have at his command the botanical knowledge required for establishing the identifications and origins of individual species, without which fixed points of departure can not be secured and distributional studies become a tangle of dry and worthless details.

CURRENT OPINIONS AND INFERENCES.

De Candolle's verdict on the origin of the cocoanut was rendered in rather impressive form, and has commanded more general confidence than even that author himself could have expected.

> I formerly thought that the arguments in favor of Western America were the strongest. Now, with more information and greater experience in similar questions, I incline to the idea of an origin in the Indian archipelago. The extension toward China, Ceylon, and India dates from not more than three thousand or four thousand years ago, but the transport by sea to the coasts of America and Africa took place, perhaps, in a more remote epoch, although posterior to those epochs when the geographical and physical conditions were different to those of our day.[1]

Martius, Spruce, and Wallace, the most eminent naturalists who have made detailed studies of the palms of South America, have all accepted without serious question the Asiatic or Polynesian origin of *Cocos nucifera*, though well aware that all the other species of the genus are natives of South America.

> Eighteen species of Cocos are known, seventeen being natives of South America, principally of Brazil, while only one, the well-known cocoanut, is a native of the Old World, though it is now universally cultivated in every part of the tropics. Few species of the genus are found in the Amazon district. They appear to prefer drier and more elevated countries, some of them reaching an altitude of near 8,000 feet above the sea.[2]

Relying on such opinions a recent anthropological writer, with an appreciation of the advantages of direct communication, but with complete disregard of historical fact, has advanced the idea that the cocoanut and the banana were introduced by the Spaniards, not from the East, but from the West, and at a date subsequent to those of printed books containing accounts of both plants as existing in large quantities in America.

> The presence in America of the banana, which, like the cocoanut, has been fancifully accounted for as the result of some prehistoric dissemination, bears witness to the contact with the East. The banana, which can be propagated only by living plants, came to Mexico by way of Manila within the last three hundred years and has been widely distributed over the tropics of America. The same is true of the plantain.[3]

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[1] Origin of Cultivated Plants, p. 435. (London, 1886.)

[2] Alfred Russel Wallace, Palm Trees of the Amazon and their Uses, p. 124. (London, 1853).

[3] American Anthropologist, 1900, p. 70. On the contrary, the Philippine varieties of the banana seem not to have been introduced into Mexico even yet. The early introduction from the Philippines of plants propagated by cuttings and short-lived seeds is also not to be assumed without proof, since the voyage to Mexico was much longer than the return journey, owing to the necessity of sailing around the north Pacific to secure favorable winds. Moreover, the sailing route from the Philippines to Mexico was not discovered until about forty years after the publication of Oviedo's account of the cocoanut and banana in America. Regular communication was not opened until another decade had passed.

Doubtless as a result of his studies in plant geography, Grisebach entertained a belief in the American origin of the cocoanut and placed its original habitat on the western coast of Panama.[1]

The reasons for this opinion seem never to have been explained; but the indications are that Grisebach accepted De Candolle's suggestion that the cocoa palm did not not occur normally on the American mainland, but at the same time appreciated the logical necessity of associating the species as closely as possible with the American palm flora. In any event, the Panama theory, while sometimes quoted out of deference to Grisebach's botanical reputation, has received no general attention or acceptance, and the belief in an Asiatic origin, with a possible maritime or accidental introduction to the islands of the Bay of Panama, is still generally held.

To De Candolle and other writers Seeman's objection to an American nativity has seemed adequate and incontrovertible, namely, the relatively small importance of the cocoa palm in America compared with its great and highly diversified utility on the shores and islands of tropical Asia. But, as suggested elsewhere, the abundance of other useful plants in America gave little incentive to specialization of the cocoanut, while the poverty of the indigenous floras of the Pacific islands focused human attention on the few species obtainable and led to the discovery of a great variety of secondary uses. Thus the Polynesians, for want of more suitable materials, make fish nets from the fibers of the yam bean (Pachyrhizus), one of the most primitive of tropical culture plants and probably of American origin, though the fiber is not known to be used either in America or in Asia, whither the plant was carried in prehistoric times.

But use is, after all, primarily a function of human skill and industry and may be no index of nativity. Nearly all the plants cultivated in the United States are of exotic origin, and a large proportion of the more important species came from the Old World. Moreover, if we think of the cocoa palm as having passed gradually across the Pacific, it is easy to understand that in addition to the uses discovered by the Polynesians there would be transferred to it when it approached the shores of Asia a large variety of requirements which had been met previously by some of the numerous economic palms native in the Malay region. Thus toddy or palm wine has been drawn since time immemorial from a considerable number of Asiatic and Malayan species by methods which it was not difficult to adapt to the cocoanut. This and many other human arts and adaptations which have been interpreted as indications of the very great antiquity of the species in Asia may possibly have been developed in connection with indigenous species and have been ready and waiting, as it were, for the arrival of the cocoanut.

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[1] Flora of the British West Indies, p. 522 (1864).

IMPROBABILITY OF SPANISH INTRODUCTION.

The existence of the banana in prehistoric America has been obscured by the record of an introduction from the Canary Islands to Santo Domingo in 1516; but neither history nor tradition has given any intimation that cocoanuts were brought by the Spaniards from the Old World to the New. Moreover, there are several other facts which seem to preclude belief in such a transfer. The banana is supposed to have reached the Canaries from West Africa; but the cocoanut has never been found to thrive in the Canaries, nor in any part of the Mediterranean region, and it is not supposed to have existed in West Africa in the early years of the sixteenth century, but is believed to have been carried thither, subsequently, from America. It is also well known that the papal division of the "Indies" between the Portuguese and the Spanish gave the latter no access to the Indian Ocean by way of the Cape of Good Hope. Thus it would seem that if the Spaniards learned about cocoanuts, and obtained them to plant in their new possessions, it must have been from their Portuguese rivals. Such an event is highly improbable, and if it had occurred would doubtless have been made a subject of historical record and comment.

But even though arrangements might have been made for securing nuts in this manner, it would have been very difficult or impossible to keep them alive long enough to survive the voyage from the East Indies to the West. In spite of its size the cocoanut is a rather delicate and short-lived seed, and it is very improbable that at that time any Europeans had the knowledge and skill necessary to select the nuts and give them proper care on the journey.

If the cocoanut had been established in America in spite of these difficulties, it could only have been because somebody placed a high value upon it. The success of the effort would have been a matter of much self-congratulation by the Spaniards, and would scarcely have escaped record by some of the numerous early chroniclers of New Spain, several of whom show a lively interest in recounting the importation of European plants. To judge from their reports to their sovereigns, the early agents of the Spanish crown in America would have lost no opportunity of realizing full value for any special service of this kind.

Pickering was apparently the originator[1] of the statement, repeated in other compilations, that cocoanuts "were seen by Columbus on his fourth voyage, in Central America." Unfortunately, it seems to be impossible to verify this interesting information. A careful reading of the Churchill version of the life of Columbus by his son Ferdinand, which is indicated by Pickering as the authority for his statement, fails to reveal any direct indication of the cocoanut. Although the existence of seven kinds of palms is noted, they are not described in

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[1] Chronological History of Plants, p. 428 (1879).

detail; although "coco-nuts" are mentioned, the context shows that they were the seeds of Theobroma, and not of Cocos, and although wine is said to have been made from the juice squeezed from the pith of a palm, the tree is described as having "such prickles on the trunk as the thorn." It may have been *Acrocomia vinifera*, but certainly was not the cocoa palm.

But these references to palms are suggestive as showing the extent of interest taken in the subject during the lifetime of Columbus, and they thus afford further proof, if any were needed, against a very early introduction by way of Spain. Moreover, unless Columbus himself brought over the cocoanut, it is extremely improbable that an introduction by the Spaniards could have been made early enough to have deceived Oviedo, Cieza de Leon, and Acosta, even if we admit, for the sake of argument, the most incredible diligence on the part of the natives in disseminating the species. Under exceptionally favorable conditions the cocoanut may begin bearing in five or six years, though often it does not till considerably later, and the first nuts are usually small and infertile. Ten or fifteen years generally elapse before the tree reaches effective maturity, so that it becomes doubtful whether even the cocoanut palms which Acosta saw at San Juan de Puerto Rico were the result of European planting at that place, since, if introduced by the Spaniards, the trees would have been comparatively young and still the objects of curiosity and remark. The facts of their history would still have been fresh in the minds of living men and of exactly the nature to be told to a visitor interested in natural objects and plant introduction.

And behind these improbabilities is a more fundamental reason for disbelief in any such extended efforts at introduction by the early Spanish explorers, namely, the fact that the cocoanut is of no very considerable importance in continental regions, or even in large islands. It is only on the coral reefs and atolls of the Pacific, where there are often no other means of securing fresh water, that the cocoanut is of really vital importance. Elsewhere it is a luxury rather than a necessity, as far as the question of food is concerned, although its secondary uses are in many places very numerous and highly differentiated, so that it is now well-nigh indispensable to some millions of the human species. But in America and Africa, at least, the cocoanut is not a product of primary value, except in communities dependent upon its sale as a commercial product. There are other woods much easier to work, other fibers much easier to extract, and other calabashes[1] much easier to cut and otherwise more suitable for drinking cups and culinary utensils. The earlier Spaniards were quite unacquainted with the part of the world where the cocoanut is of conspicuous importance as an economic plant, and it is simply an anachronism to predicate in them any special zeal or anxiety to provide their West Indian possessions with this palm. The accounts given by many early writers on the Tropics show that it was unappreciated as a fruit by the explorers, whose quest was primarily for gold and spices, not for objects of no recognized value in Europe. Such were often taken home to exhibit as curiosities, but this would not be a sufficient reason for international efforts at extending the distribution of such a product.

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[1] In the West Indies, Mexico, and Central America the so-called "calabash trees," species of Crescentia, furnish hard-shelled fruits readily available for domestic purposes, while the ancient Peruvians cultivated the bottle gourd (Lagenaria) on a large scale. Moreover, pottery was manufactured all the way from Mexico to Peru and elsewhere in tropical America.

THE COCOA PALM IN ANCIENT AMERICA.

EARLY SPANISH ACCOUNTS.

But if the probabilities are all against an early introduction of the cocoa palm by the Spaniards, what may be termed the historical evidence for the prehistoric existence of the cocoanut in tropical America is more than adequate; for although none of the early writers affords a direct statement that the cocoanut was here before Columbus, this oversight can be understood by reflecting that nobody raised the question until some generations afterwards.

Oviedo, contemporary and friend of Christopher and Diego Columbus, visited the Isthmus of Panama in 1515, two years after the discovery of the Pacific Ocean. From 1520 to 1523 he was again in Colombia and the West Indies and published the summary of his "Natural History of the Indies" in 1526, after which he spent many years in America as a high official of the Spanish crown, continually adding to his monumental history, the manuscripts of which furnished materials for numerous other writers, but did not themselves reach the press until 1851. Oviedo's account of American palms occupies 5 quarto pages, about half of this space being given up to a thorough and circumstantial description of the appearance, structure, qualities, and uses of the cocoa palm and its fruit.

> These palms or cocos are tall, and there are many of them on the coast of the Southern Ocean, in the province of the cacique Chiman, and many in that which they call Borica, and many more than in both places in an island of the southern gulf which is in the ocean, 100 leagues or more from the coast of Peru.
>
> After I wrote the account which I have mentioned (1526) I was in the province and point of Borica [Costa Rica] and ate some of these cocos and carried many along to Nicaragua, and I loathed them, and others did and said the same. In fact, it is a food for men who work, and the very strong, and for others a little of this fruit is enough, for eaten continuously as was there done is not for all stomachs.[1]

Nor is it easy to understand how the direct testimony of even one such writer as Acosta should have been set aside. That historian spent seventeen years in America—from 1570 to 1587—and had extensive personal acquaintance with Panama, Peru, and Mexico. His numerous histories and theological works were mostly written in a Jesuit monastery on the shores of Lake Titicaca, and he had the opportunity of drawing for information upon the numerous and intelligent members of this order, several others of whom wrote contemporary histories of American countries, though seldom exhibiting Acosta's wide interest in nature.

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[1] Historia General y Natural de las Indias, vol. 1, p. 335 (Madrid, 1851).

> It were not possible to reckon all the fruites and trees at the Indies, for that I remember not many, and there are many more whereof I have no knowledge; and in my opinion, it were troublesome to speake of all those I now remember . . . yet do I not thinke it good to passe away under silence the Cocos or Indian palmes, by reason of a very notable propertie it hath. I call them palmes, not properly, or that it bears dates, but that they are trees like to other palmes. They are high and strong, and the higher they grow the broader they stretch out their branches. These Cocos yield a fruit which they likewise call Cocos, whereof they commonly make vesselles to drinke in, and some they say have a vertue against poison, and to cure the paine in the side. The nutte and meate being dried, is good to eate, and comes neare in taste to greene chestnuttes. When the Coco is tender upon the tree, the substance within it is, as it were, milke, which they drink for daintines, and to refresh them in time of heate. I have seene of these trees in San Juan de Puerto Rico, and other parts of the Indies, and they report a wonderful thing, that every moneth or Moone, this tree casts forth a new branch of this Cocos; so as it yeeldes fruite twelve times in the yeere, as it is writte in the Apocalips: and in truth this seems like unto it, for that all the branches are of different ages, some beginning, others being ripe and some half ripe. These Cocos are commonly of the forme and bignes of a small melon.[1]

Acosta later devotes a special chapter to the plants introduced to America by the Spaniards, and thus we have both direct and indirect evidence that the idea that the Spaniards brought the cocoanut was not rife in his day. Cieza de Leon, who traveled in South America between 1532 and 1550, and who wrote the first sailing directions for the Pacific coast, mentions an "island of Palms" off the coast of Colombia, near Buenaventura.

> Thence the coast trends S. ¼ E. to Cape Corrientes, and following the same course vessels arrive at the island of Palms, so called from the quantities of those trees which grow on it. It is little more than a league and a half around. It has rivers of fresh water, and used to be inhabited. This island is 25 leagues from Cape Corrientes, in 4⅓°.[2]

Oviedo also describes the port of Buenaventura as 5 leagues from the "isla de Palmas," and it is evidently the same island to which Dampier refers in his account of the same coast.

> From Cape Corrientes to the great river of Bonaventura is twenty-three leagues. In the midway is the Island Palmas, which is a small, woody island, and hath a sand on the southeast side, stretching from one end of the island to the other.[3]

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[1] Acosta, Natural and Moral History of the Indies, Hakluyt ed., pp. 252, 253. (London, 1880.)

[2] Travels of Cieza de Leon, 1532–1550, Hakluyt ed., p. 20 (1864).

[3] Dampier's Voyage (London, 1729).

But this is not the modern Cocos Island, as De Candolle seems to have supposed:

> The navigators Dampier and Vancouver found it at the beginning of the seventeenth century, forming woods in the islands near Panama—not on the mainland—and in the Isle of Cocos, situated at 300 miles from the continent in the Pacific. At that time these islands were uninhabited.[1]

Indeed, with the above passage in view, it is difficult to believe that De Candolle had a personal acquaintance with Dampier's 'Voyages,' since in two places it distinctly says that that worthy did not visit Cocos Island, though making a large number of references to the cocoanut palm and the banana as occurring on the American mainland all the way from Ecuador to Mexico, not only about the Spanish settlements but among the wild tribes of the Colombian coast, with whom he obtained friendship because of the common enmity to the Spaniards. Like Oviedo nearly two centuries before, he found Point Burica, the southern extremity of Costa Rica, "full of coco-nut-trees."[2]

Francisco Hernandez also wrote, in the sixteenth century, what still remains the largest contribution to Mexican botany. He describes and figures the cocoanut among the western Indies (*occidentales Indos*), but his account was evidently derived largely from travelers who had visited the Philippines, and as Hernandez also states that the tree did not occur in "New Spain" he has been quoted in proof of the non-existence of the cocoanut in America in pre-Spanish times, an inference which will receive attention in connection with the American names of the cocoanut.

The mistake regarding the statements of Hernandez has, however, served a useful purpose in calling forth from Velasco a definite statement regarding the pre-Spanish existence of the species in America. This assertion was fully credited by the botanist Spruce, the most recent and careful student of South American palms.

> It is curious that, of the early Spanish writers on the natural history of the New World, those who knew only the eastern side of the continent, the West Indian Islands, and Mexico, such as Hernandez and Oviedo,[3] assert that the coco palm was introduced into America by the Spanish settlers, while those who were familiar with the Pacific coast, including some of the earliest travelers in Peru, such as Cieza de Leon, say positively that it was already found growing on that coast, especially in the equatorial regions, when the Spaniards first arrived there. It is possible that all spoke truly according to their knowledge, and that, although this plant may be indigenous only to the islands of the Pacific Ocean, it had really reached the western coast of America, either by accident or by design, long before the advent of the white man.

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[1] Origin of Cultivated Plants, London, p. 431 (1886).

[2] Dampier's Voyages, London, vol. 4, p. 90 (1729).

[3] Spruce, Journ. Linn. Soc. London, vol. 11, p. 80 (1871). As neither Hernandez nor Oviedo refers to any such introduction, it would seem that this statement, like many others regarding the cocoanut, must be taken as a result of the failure to consult original authors.

Velasco, in his eagerness to vindicate his country's claim to the "Hatun-Chonta," or great palm, as the Indians call it, gets very angry with those who dispute it. "One may see," he says, "with what levity some authors relate a thousand falsehoods like Francisco Hernandez, a native of Mexico, who in his Latin history asserts that cocos were transplanted from the East to the West Indies by the Spaniards; whereas on their first arrival they found cocos laden with fruit, which is never seen on stems less than from 16 to 20 years old."

INTRODUCTION TO ATLANTIC COASTS.

The theory of the Spanish introduction of the cocoanut to America has been supported by references to Sloane, Martius, Piso, Marcgraf, and others, who give more or less distinct testimony to the effect that the Spaniards and Portuguese introduced it into Jamaica, Guiana, Brazil, and West Africa. But no discredit to these witnesses is implied in the supposition that the cocoanuts were not brought from Spain, where there were none, but from the American continent, where we have such excellent reasons for believing that there were many. The numerous Spanish expeditions to Mexico, Central America, and Peru were accustomed to make long visits for refitting their ships, both going and coming, at Santo Domingo and Jamaica. What would be more natural than that the early colonists would secure cocoanuts in this way, as well as cacao and other plants which they had from the American mainland?

AMERICAN NAMES OF THE COCOANUT.

The origin of the name *cocoa* or *coco*, as the earlier writers used it, seems to have remained quite as obscure as that of the tree itself. Oviedo refers to the fruit of several species of palms as "cocos," and seems to have been the first to record the fanciful idea that that word was applied to the cocoanut because the three foramina or "eyes" suggest the grimace of monkey, a notion which Hernandez and many subsequent writers have ascribed to the Portuguese, and some lexicographers have derived coco from a Portugese name for monkey, *macaco* or *macoco*. Others have thought to trace it to the Greek *κοῦκι* (*kouki*), and even to an ancient Egyptian word *kuku*, which was formerly thought to apply to the cocoanut; and although Seeman furnished in 1868 excellent reasons for believing that at least the Egyptian reference does not apply to the cocoanut, but to *Borassus aethiopum*,[1] the Egyptian theory is still repeated in the latest editions of our most popular dictionaries. Nor did anybody attempt to show that either Hernandez, Acosta, or any of their contemporaries was acquainted with either the Greek or the Egyptian words, or that they were familiar with the cocoanut before coming to America. Hernandez refers, whether correctly or not, to Strabo,[1] which indicates that he would not have avoided mention of any other Greek writers, while Acosta prefaces his discussion of the cocoanut by the following remark:

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[1] Flora Vitiensis, pp. 275–278. *Borassus aethiopum* stands in the *Index Kewensis* as a synonym of *B. flabellifer* of the East Indies. Drude admits (Engler and Prantl, *Natürlichen Pflanzenfamilien*) but one species of Borassus, distributed in cultivation from Senegambia to Ceylon, Hindustan, and the Sunda Islands.

> And it is an admirable thing to see so many different formes, tastes, and effects unknowne, whereof we did never hear speake before the discoverie of the Indies. And whereof Plinie himselfe, Dioscorides and Theophrastus (yea, the most curious), had no knowledge, notwithstanding all their search and dilligence.

Moreover, it seems probable that the word coco as a lineal descendant from the Latin *coccus* was in use among the Spaniards in its original sense of a seed, nut, or fruit, and the seeds of Cocculus or India berries are still called in Spanish *cocas de Levante* in much the same way as Hernandez referred to cochineal as "Cocco Indico." Both Oviedo and Acosta used the word in a wide generic sense for the seeds of several palms, and it is still applied to the seeds of smaller palms which much resemble those of Cocculus and are strung for rosaries. Acosta also refers to the seeds of a palm of Chili (Jubaea) as *coquillos* (modern *coquitos*), and describes the large fruits of Bertholletia (Brazil nut) or other Lecythidaceae as "another kinde of cocos" containing almonds. We have thus apparently another case like those of Mimosa and Cereus,[2] where ordinary Spanish words adopted into botanical nomenclature have been tortured at great length to fit the most improbable theories of classical Latin, Greek, or even more ancient derivations. But though already possessed by the Spaniards, the word coco was by no means new to America. Eighteen of the names of plants in the "Historia" of Hernandez begin with *coco* and twenty-eight with *caca*, which seem to have been used interchangeably. Thus Dampier and Cockburn frequently refer to cacao (Theobroma) as "coco," "coco-nuts," and "cocoa." The difficulty which we still have in attempting to restrict *cacao* to Theobroma, *coca* to Erythroxylon, *cocoa* to Cocos, and *coco* to Colocasia may be but a legacy from the popularity of these syllables in the plant names of American aboriginal tribes. However curious such a coincidence between the Spanish and American word *coco* may seem to us, it appears to have produced no such effect upon Hernandez, even when explaining the name of the plant *cocoyatic*[3] on the ground that the leaves were similar to those of palms, and, although not noted by Hernandez, this remarkable suggestion seems to receive support from the fact that the *cocobut* plant has large spherical swellings near the roots.

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[1] Hernandez's chapter on the cocoanut opens with the following caption and first sentence:

"*De Nucis Indicae, et Cocci vocati arbore.* Nux Indica, quam vulgus Indorum *Maron*, Strabo vero (ut quida volut) Palmam vocat, a Mexicensibus *Coyolli*, a Lusitanis ob oculos quosdam Cercopitheci similes Coccum, a vulgo vero Persarum, et Arabum nuncupatur *Harel.*"

[2] "Los cardones que los cripstianos llaman cirios . . ." Oviedo, vol. 1, p. 311.

[3] "*Cocoyatic, seu herba Palmae simili.*—The herb *cocoyatic*, which the people of Michoacan call Xahuique, has the leaves of Porrum or of a small palm, whence the name." "Nova Plantarum, Animalium et mineralium Mexicanorum." Hernandez, p. 144 (Romae, 1651).

The statement of Hernandez, already quoted, that the Mexicans called the cocoanut "coyolli" is turned by De Candolle into an argument against an American origin on the ground that the word *coyolli* "does not seem to be native," though no attempt is made to indicate whence it was introduced; nor is the implication of an extra-American word met by the theory of maritime distribution. Yet if *coyolli* was not an Aztec word it either did not come alone or it fell into very friendly society with dozens of others, like amolli, ylli, coyopatli, cocotzin, chilli, quilamolli, copalli, and atolli. But a different objection may be taken to *coyolli* as an Aztec name for the cocoanut. It is well known that the Aztecs came from the temperate plateau of Mexico and that their power had rather recently been extended to the tropical coast regions.

It seems probable from the descriptions and figures of Hernandez that the coyolli was a native Mexican palm, probably Acrocomia, the fruit of which has the outer layer edible, oily, and yellow, so that Hernandez supposed it to be the same as the Areca or betel palm of the Philippine Islands, which is not known to have any similar name in the Eastern Hemisphere, while *coyolli* is still current in southern Mexico and Guatemala for *Acrocomia mexicana.* Although declaring that the Mexicans (Aztecs) called the cocoanut "coyolli," Hernandez distinctly says that he never saw any of the trees in New Spain. This, however, is not necessarily a discrepancy or an indication that Hernandez thought that the palm had been introduced by the Spaniards, since "Nova Hispania" was used by some of the early writers in a rather narrow sense for the Aztec[1] region of Mexico, and not for that country as defined by its modern boundaries. But before this Hernandez had already said that the cocoa palm was generally distributed in the East and West Indies, and especially in maritime and sandy places about human habitations. He secured from travelers accounts of many Philippine plants and their uses, which seem to have been largely drawn upon in the present instance. But it must not be forgotten that even in his time the "Indies" were still one-quarter of the world, for as Acosta quaintly says:

> . . . Wee meane by the Indies those rich countries which are farre off and strange unto us. So we Spaniards do indifferently call Indies the countries of Peru, Mexico, China, Malaca, and Bresil; and from what parts soever of these any letters come, wee say they bee from the Indies, which countries be farre distant and different one from another.

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[1] According to Humboldt the Kingdom of Montezuma occupied only one-eighth of the territory of modern Mexico. Political Essay on the Kingdom of New Spain, vol. 1, p. 68 (New York, 1811).

Our modern curiosity as to how the cocoanut and other plants crossed the Pacific had not yet developed. Hernandez learned about the Philippine plants by questioning travelers who were going and coming across Mexico, but this was a matter far different from the introduction of the Philippine palms to use and culture in Mexico, which with three more centuries of improved opportunity has not yet taken place. Chocolate was certainly a far more important article to the Spaniards than the cocoanut, and yet the cacao tree is believed not to have been introduced from Mexico to the Philippines until after 1660, a century later than Hernandez's visit; and Humboldt believed that *Citrus trifoliata* was the only Asiatic species which had become established in Mexico.[1] This would seem to render improbable any very extensive introductions of tropical plants at an earlier date, and is a strong reminder that notwithstanding its obvious importance the introduction of useful plants is a subject still generally neglected in the agriculture of the most advanced countries, and even in dealing with plants which can be grown from seed of indefinite vitality instead of with the delicate and short-lived germs of tropical species.

But to return to Hernandez. We find in the sentence already quoted[2] the name *maron* ascribed to the "vulgus Indorum," or ordinary Indians, as distinguished from the "Mexicensibus," a fact which seems to have been entirely overlooked by De Candolle, who, after dismissing *coyolli*, leaves us with the implication that no genuine American name for the cocoanut was known. Possibly he supposed this word to pertain to the East Indies, as does much of the essay of Hernandez. Such, however, is not the case. Nothing resembling *maron* appears in the extensive lists of Polynesian, Malayan, and Asiatic names, but it was reported by Heller, in 1853, as apparently still in use in southern Mexico.

But etymological arguments based on old records are often of little use except as literary confirmations of facts already ascertained by more reliable evidence. Thus, the cocoa question might be carried another stage around the world when we read, in Pigafetta's account of the voyage of Magellan, that among the native products offered by the people of the Philippine island of Samar that "one which they call *cochi* is the fruit which the palm trees bear." But as no subsequent traveler has recorded such a name in that quarter of the globe, we may reflect that Pigafetta was an Italian among Spaniards and Portuguese sailors, some of whom had previously visited the "Indies," and that he did not show a philologist's caution in studying the forms and origins of words.

Although, as indicated above, the cocoanut is supposed to have been introduced into Brazil by the Portuguese, Nieuhoff recorded a native name for it in 1647.

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[1] Loc. cit., vol. 2, p. 365.

[2] P. 267, footnote.

> There also grow coco trees in Brasil, called by the natives inajaguacuiba, and the fruit inajaguacu.[1]

But, as Nieuhoff had already explained that the fruit of the pindava palm (Maximiliana?) was called *inajamira*, meaning "small cocoanut," we may be dealing, as in the case of *coyolli*, with a recently extended use of some native word or combination misinterpreted by Nieuhoff.

THE COCOA PALM AN AMERICAN SPECIES.

BOTANICAL EVIDENCE.

If the historical evidence is ample for the establishment of the existence of the cocoanut in America before the advent of Europeans, the botanical evidence is no less conclusive to the effect that it had been there a long time. In other words, it is a member of the American and not of the Asiatic flora, though the reasons for this belief have been very inadequately appreciated. Thus, De Candolle noted the existence of eleven other American species of Cocos as one of the arguments for the American origin of *C. nucifera*, though this fact appeared to be outweighed by others indicating an Asiatic nativity. It is not, however, a matter of eleven or more species of Cocos, but of the whole family Cocaceae, consisting of about 20 genera and 200 species, all strictly American with the single exception of the rather aberrant African oil palm (*Elaeis guineensis*), which has, however, an American relative referred to the same genus. Several fossil palms from western Europe are supposed to belong to this group, but the cocoanut is the sole[2] representative which has been connected with Asia and the Malay region, though no reason has ever been advanced to show why the other members of the group could not have established themselves and maintained an existence under Malayan conditions, which are in every way adapted to palms, and which support hundreds of indigenous species belonging to other families of the group. Nor do we any longer take refuge in a suggestion formerly used in dealing with difficult cases of geographical distribution, and argue that the cocoanut and the banana were such desirable fruits that they were separately created or bestowed upon the inhabitants of both hemispheres. The theory of the independent development of the same species, however, is still occasionally drawn upon, and may have a certain propriety in dealing with the phylogeny of groups which have undergone a parallel development. Thus, if other species of Cocos, or closely allied genera, existed in the tropics of the eastern hemisphere, we might not be confident regarding the affinities of a type so different from its congeners as is the cocoanut.[1] But with no oriental relatives in even generic range there is no rational basis for doubt that the species belongs to an American series.

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[1] Churchill's Travels, vol. 2, p. 134 (1732).

[2] *Cocos mammilaris* Blanco, from the Philippines, is based on one of the numerous Malayan culture varieties of *C. nucifera*.

Under an evolutionary conception of nature we must believe that economic species like all others originated in definite areas, and that they have been domesticated at definite periods and distributed by natural means. There may, of course, have been independent discoveries of the usefulness of well-developed and already desirable fruits, and many such fruits have remained in the Tropics comparatively little affected by cultural selection. Of this, the several species of Anona furnish good examples. The sour-sop, the sweet-sop, and the custard apple are American fruits which probably reached in their wild state something near their present degree of excellence. Although now widely distributed throughout the Tropics, they are usually planted in a rather desultory manner and do not receive the same amount or kind of attention bestowed upon staple food plants or commercial products. As already remarked, the cocoanut as a fruit is of primary importance only in the coral islands of the Pacific, where the number of economic plants is limited, and where even fresh water is sometimes wanting, and only the milk of the cocoanut makes human life possible. In America the relative value of the cocoanut places it in the list with such natural products as the Anonas, with which it agrees in offering little differentiation of varieties.

PREHISTORIC INTRODUCTION OF OTHER PLANTS.

A wild product of secondary value may not receive careful attention until quite late in the history of an agricultural people; but, on the other hand, it is impossible to agree with Dr. Watt[2] that such staple food plants as the yams were "cultivated at a much later date than most other vegetables, probably on account of the fact that without the trouble of cultivation they afforded an unfailing supply of food." This theory is altogether too ingenious. Primitive peoples are not likely to have undertaken to cultivate anything the utility of which had not been adequately demonstrated, and it is exactly with such plants as Dioscorea and Pachyrhizus that the beginnings of primitive agriculture might be expected.[3] Watt's theory, however, is of much interest because it was intended to explain the probability that the yam was not in use in Sanscrit times, or at least had no distinctive name. In China, as in the Malay region, Polynesia, and America, yams appear to have been among the earliest, as they are still the most important, of cultivated root crops. The Chinese yam (*Dioscorea batatas*) never penetrated India, has never been reported in the wild condition, and was probably not a native of the Asiatic continent. Several other species cultivated in India and neighboring regions are also not known in the wild state, and presumably came from farther east. The probability that *Dioscorea alata*, at least, was carried westward by the primitive race which transported the cocoanut is very great, and is supported by the fact that the yam bean (Pachyrhizus), a leguminous plant with a large yam-like root, and of even more highly probable American origin, was introduced in prehistoric times and is still sparingly cultivated in India. In Polynesia the use of Pachyrhizus in religious ceremonies seems to indicate former cultivation, but what is still more interesting, the Polynesians, like the aborigines of America, had knowledge anticipating the modern discovery of the fertilizing value of leguminous crops, and encouraged the growth of Pachyrhizus in their fallow clearings in order to render the land more quickly able to yield good crops of yams.[1]

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[1] In reality Cocos should be treated as a monotypic genus to contain only *C. nucifera*. The remaining species also are not a natural assemblage and should be separated into several generic groups.

[2] Dictionary of the Economic Products of India, vol. 3, p. 120.

[3] Seeman has noted (Botany of the Herald, p. 73) that, with the exception of the potato (Solanum), the root crops cultivated on the Isthmus of Panama, the yam (*Dioscorea alata*), yuca (Manihot), camote (Batatas), and otò (Colocasia), are all propagated by cuttings of great vitality, which "may be left for weeks in the field, exposed to sun and rain, without receiving any injury."

The sweet potato furnishes another instance of the trans-Pacific distribution of a useful plant in prehistoric times, though it may have come into use later or traveled less rapidly than the cocoanut. In the equatorial belt the sweet potato was doubtless, as it still is, a much less important crop than the yam, but among the subtropical Hawaiians and Maoris it is believed to have been the principal food plant. As with the cocoanut, the sweet potato was designated by cognate names throughout the entire Pacific region, and, moreover, it affords a philological argument wanting with the cocoanut, since the Polynesian names *umara*, *kumara*,[2] and *gumara*, are apparently represented on the continent of America by the word *cumar*, in the language of the Indians of Ecuador. The Mexican name "camote," supposed to have been transferred to the Philippines in Spanish times, may also be derived from the same linguistic root. Like the banana, the sweet potato has become seedless through long cultivation and propagation exclusively from cuttings. The theory of distribution by ocean currents has here no standing; but the botanical evidence of American origin is not nearly as strong as in the case of the cocoanut, since many other species of the same and related genera are very widely spread through the Tropics. Rutland and others have drawn from the names and distribution of the sweet potato arguments for Polynesian contributions to prehistoric America; but if the present interpretation of the history of the cocoanut be accepted it will afford additional support for the opinion shared by De Candolle that the sweet potato is of American origin and was carried by man from east to west. But, without attempting here an exhaustive discussion of the nativity and history of either the sweet potato or the banana, it is sufficient to reiterate that the existence of these two seedless plants on both sides of the Pacific in prehistoric times goes far to demonstrate former human communication by means of more extensive land masses or, through greater nautical skill, across seas commonly deemed impassable to primitive man.

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[1] Engler's Bot. Jahrb., vol. 25, p. 640 (1898).

[2] In addition to this name the people of one of the Viti Islands have a term which means "foreign yam," a possible indication of an arrival subsequent to that of the yam.

THE DISSEMINATION OF THE COCOA PALM.

At the present time the cocoa palm is to be found on nearly all tropical coasts, though there are still many hundreds of miles of shore line in Africa and Australia not yet adorned by this magnificent plant. Of the few subtropical countries, where the species has been grown successfully, southern Florida is perhaps the most important; for while the tree is able to thrive in a great variety of soils, and even in pits dug in solid limestone, it is apparently very susceptible to injury from extremes of temperature, and is incapable of being naturalized in regions subject even to moderate cold, or in those where great heat must be endured. But, like many other palms, it will, if planted, vegetate for many years in situations where fertile seeds are never matured.

Being thus strictly limited to the Tropics the habits and conditions of growth of the cocoa palm have received comparatively little attention from the botanical writers of temperate regions. Although, as already indicated, it is probable that the cocoa palm was not disseminated in the Atlantic Ocean until after the Spanish discovery of America, its rapid extension in the Western Hemisphere, together with the fact that it was found to be so widely spread in the East, seem to have been taken as indications that its distribution has been extended by natural causes. But while it evidently existed much earlier in the East Indies, there is some ground for the opinion that its arrival in Asia was comparatively recent, or subsequent to the development of a considerable degree of civilization in the countries bordering on the Indian Ocean; and even in Mohammedan times there is said to have existed a brotherhood devoted to the dissemination of the cocoanut among the islands of this region. In Ceylon there is an extensive and well-preserved tradition[1] implying a rather late introduction of the cocoanut. Many of the details are fanciful, but Seeman, who gave the matter thorough study, was inclined to credit the principal points.

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[1] Seeman's Popular History of the Palms, p. 146 (London, 1856).

> The littoral parts of Ceylon are now densely covered with this tree, and it looks more at home there than I have ever seen it in any part of the world. Yet both tradition and history affirm that at one time the cocoanut was unknown in Ceylon. Not far from Point de Galle there is carved on a rock the gigantic effigy of a native prince, Kottah Rayah, to whom is ascribed the discovery of the properties of the cocoanut, which before his time were unknown, as was also the tree. Moreover, the oldest chronicle of Ceylon, the "Marawansa," the historical value of which is now fully admitted, is absolutely silent about everything relating to the cocoanut, whilst it never fails to record, with tedious minuteness, every accession of other fruit trees made to the plantations by native princes. Now, is it probable that a fruit like the cocoanut, which is often tossed about the ocean for months without losing its germinating power from the effects of salt water—is it probable that if such a fruit had been indigenous to any part of Asia, it should have reached Ceylon only in a comparatively recent historical period?[1]

From the limited distribution of the cocoanut and other tropical products St. Pierre deduced a confirmation of the formerly accepted brevity of the earth's history, and while we can not make use of the argument for its original purpose, it may still be recommended to the attention of those who believe in an Asiatic origin and an aquatic distribution.

> I am persuaded, at the same time, that the greatest part of flitting plants must have a principal center, such as a steep rock, or an island in the midst of the sea, from whence they diffuse themselves over the rest of the world. This leads me to deduce, what I consider an irrefragable argument in support of the recent creation of our globe; it is this, were the globe of very remote antiquity, all the possible combinations of the propagation of plants by seed would have been already completed all over the world. Thus, for example, there would not be an uninhabited island and shore of the seas of India, which you would not find planted with cocoa trees, and sown with cocoanuts, which the ocean wafts thither every year, and which it scatters alternately on their strands by means of the variety of its monsoons and of its currents. Now, it is unquestionably certain, that the radiations of that tree and its fruit, the principal focusses of which are in the Maldivia Islands, are not hitherto diffused over all the islands of the Indian Ocean . . . . There are, in like manner, a multitude of other fruits between the Tropics, of which the primordial stocks are in the Molluccas, in the Philippines, in the islands of the South Sea, and which are entirely unknown on the coasts of both continents . . . . I shall pursue this reflection no farther; but it evidently demonstrates the newness of the world. Were it eternal, and exempted from the care of a Providence, its vegetables would long since have undergone all the possible combinations of the chance which resows them. We should find their different species in every situation where it was possible for them to grow.

It may be that neither the evidence adduced by Seeman nor the quaint deductions of St. Pierre can be considered to have important bearing upon the question, but their views are of interest because the inferences they suggest are in accord with so many other considerations tending to prove an extra-Asiatic origin for the cocoanut.

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[1] Flora Vitiensis, p. 276.

ORIGIN OF THE VARIETIES OF THE COCOANUT.

The multitudinous uses and universal popularity of the cocoanut on the shores and islands of the Indian Ocean and in the Malay region generally have been interpreted by DeCandolle, Seeman, and others as an indication of an Old World origin. If, however, the late appearance of the cocoanut in Ceylon be taken into consideration, it becomes apparent that the theory of an Asiatic origin is incompatible with that of distribution by ocean currents; for, if the maritime theory is to be upheld, origin at a great distance must be predicated in order to explain a comparatively recent arrival and a formerly more limited distribution in the Indian Ocean. And yet this concession does not greatly improve the situation, since we have excellent ground for believing that the cocoanut has existed for several millenniums in the islands to the southeast of Asia, or long enough to permit an extensive differentiation of varieties.

As with our temperate fruits, the varieties of the cocoanut differ greatly in size, color, shape, and quality, and the trees also have varietal peculiarities. In one sort the divisions of the leaves are only imperfectly separated, a condition appearing in some of the more primitive relatives of the cocoanut. Some of the varieties appear to have been selected for special qualities, such as the flavor of the flesh, oil, or milk, or the abundance and ease of extraction of the fiber.

In America the relatively small importance of the cocoanut has not secured for it the attention necessary to the recognition of differences between the fruits of individual trees and the consequent development of varieties by human selection, but in the Malay region more than fifty sorts are reported, with distinct names and characteristics. Varietal differentiation in a plant like the cocoanut may be expected to require much more time than with annual species, probably at least ten times as long. Moreover, if it be denied that the cocoanut varieties arose entirely through an active process of artificial selection, on the ground that considerable differences must have been attained before they would have been appreciated and utilized, the time requirement is still further increased. But in any case the varieties were doubtless local at first, and their differentiation was probably favored by isolation in accordance with the general tendency among the palms to form series of similar species of limited distribution. That this process is well advanced among the cocoanuts of the Malay region would seem to indicate their presence there for several thousand years, and this fact is apparently incompatible with the late arrival of the species in Ceylon, if the winds and currents operate with any approximation of their supposed efficiency. On the other hand, it is quite conceivable under a theory of distribution by human agency that the cocoanut might have existed for an extremely long period in the Philippines and other groups to the southward before it was carried around the end of the Malay peninsula into the Indian Ocean. The cocoanut could probably not be carried inland into the humid Malay peninsula, and a people migrating thither from the islands would have been compelled to leave it behind on the coast.

OCEAN CURRENTS INEFFECTIVE.

Owing to its great weight and size, the cocoanut can be held to have reached Asia in only three ways—by means of a formerly different distribution of land masses, by ocean currents, or by human agency. There is little reason to carry the question far back in geologic time, because the strict localization of the genera and higher groups of palms gives no evidence of contact between the Asiatic and American floras since the differentiation of the principal groups took place. The theory of transfer by ocean currents has received much attention and far greater credence than the facts seem to warrant. While it is difficult to set a limit to the possibilities of such a means of distribution, the probabilities are certainly not extensive. To prove that the cocoanut is adapted especially for maritime distribution, it would be required to show that water is the normal, or at least a very frequent medium of dissemination, and that on this account selection has favored the development of thicker husks. But it is obvious that few cocoanuts ever reach the water, and that the thick husk is necessary to permit the heavy fruit to drop with safety from tall trees, and, as all nuts must make this journey, such a selection is real and universal. Moreover, the protection is even yet not adequate, so that it is customary in the East Indies to pick by hand and let down by ropes the nuts intended for planting, those which are allowed to fall being injured, frequently to the extent of failing to germinate or of furnishing only weakly and debilitated seedlings which may never attain to normal development or produce full-grown, fertile fruits. Even when no mechanical injury to the nut proper is apparent, the power of germination may be destroyed by decay, which sets in where the husk has been bruised. To insure healthy and vigorous seedlings the nuts must be fully ripe, after which planting can not be safely delayed more than a month. If kept too moist the nuts rot, but if too dry they soon lose the power of germination. If allowed to lie in the sun and become overheated, they are also killed, while under too much shade the seedlings will make little or no growth.

There is, indeed, little in the way of observed fact to support the poetic theory of the cocoanut palm dropping its fruit into the sea to float away to barren islands and prepare them for human habitation. This time-honored fancy contains several other practical difficulties. Thus, in the first place, the cocoanut palm seldom grows upon the immediate strand overhanging the water, or even in reach of ordinary waves. It is only where the shore is being undermined or through some other relatively infrequent accident that the nuts would fall into the water. It is true that accounts of floating cocoanuts are to be found in Dampier's Voyages and elsewhere, but such records show the rarity rather than the frequency of the occurrence and give us, in addition, no evidence on the viability of the seed observed. The additional facts may be cited on that side that the Hindoos have a festival in which it is customary to throw large numbers of cocoanuts into the sea, while many must be swept away from the coasts of continents and large islands by floods and swollen rivers. But it is far from correct to suppose that all nuts which reach the water are really launched for oceanic wanderings; the chances are still hundreds to one that they will be thrown back immediately upon their own coast, like other objects floating in the surf. High waves or tides, instead of floating shore débris away, merely carry it farther inland, as everybody familiar with seacoasts knows.

Then from the nuts which might reach the open sea take all except the infinitesimal number which would arrive anywhere while still alive, and reduce this by an equally great proportion which would simply be cast up to dry on the sand; reduce again for those which would be thrown back and smothered in the bushes or find unsuitable conditions of growth, and you have left still a possibility, it is true, but of a very high order of infinitesimals and utterly inadequate to accomplish the widespread distribution of the present species. Empty husks must not be counted; these sit high in the water and might easily be floated or blown off shore and would make quick journeys.[1]

In Island Life, Wallace refers to the double cocoanut (*Lodoicea maldivica*) as furnishing a conspicuous instance of maritime distribution. In reality, however, this case proves just the contrary of what was intended; for, although double cocoanuts have been thrown up for centuries on the shores of the Maldive Islands and of other parts of the East Indies, this transfer of nuts seems never to have resulted in the establishment of a single tree of Lodoicea outside the three small islands to which it is confined in the Seychelles. Until the explorations of Europeans resulted in the discovery of the palms, the East Indians had universally believed that the nuts were a marine product, on which they placed the highest value because of supposed medicinal qualities.

Shipwrecks would undoubtedly furnish the most successful method of launching viable cocoanuts, and if, as has more than once happened in Florida, there are people on hand to plant them as they come ashore, this means of extending the distribution of the species may be very effective. In fact, there seems to be but one instance on record where living cocoanuts are known to have floated to a remote island, and even in this the possibility of shipwreck is by no means excluded, since oaken timbers were also cast up on the same island about the same time.

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[1] Experiments like those of Guppy (Journ. Trans. Victoria Inst., vol. 24, p. 305, 1891) on the periods of flotation of seeds are of value, of course, only when it can be shown that the dry seeds will germinate after floating for long periods in salt water. The drier the seeds to begin with, the better they will float, but many tropical species are like the cocoanut in that their seeds when dry are dead.

> The philosopher Francis Leguat and his unfortunate companions, who were, in the year 1690, the first inhabitants of the small island of Rodriguez, which lies 100 leagues to the eastward of the Isle of France, found no cocoa trees in it. But precisely at the period of their short residence there the sea threw upon the coast several cocoanuts in a state of germination, as if it had been the intention of Providence to induce them, by this useful and seasonable present, to remain on that island and to cultivate it.
>
> Francis Leguat, who was unacquainted with the relations which seeds have to the element in which they are designed to grow, was very much astonished to find that those fruits, which weighed from 5 to 6 pounds, must have performed a journey of 60 or fourscore leagues without being corrupted. He took it for granted—and he was in the right—that they came from the island of St. Brande, which is situated to the northeast of Rodriguez. Those two desert islands had not as yet, from the creation of the world, communicated to each other all their vegetables, though situated in a current of the ocean which sets in alternately, in the course of one year, for six months toward the one and six months toward the other.
>
> However this may be, they planted those cocoanuts, which, in the space of a year and a half, sent out shoots of 4 feet in height. A blessing from Heaven so distinctly marked had not the power of detaining them in that happy island. An inconsiderate desire of procuring for themselves women constrained them to abandon it, notwithstanding the remonstrances of Leguat, and plunged them into a long series of calamities, which few of them were able to survive. For my own part I can entertain no doubt had they reposed that confidence in Providence which they had reason to do its care would have conveyed wives for them to that desert island, as it had sent to them the gift of the cocoanut.[1]

But, in spite of the quaintness of the language and the piety of the argument, we must not overlook the fact that in the desert island, as in Florida, there were men on hand who knew what to do with the cocoanuts, which had hitherto been unable to establish themselves.

FAILURE OF MARITIME DISTRIBUTION IN AUSTRALIA.

History and anthropology, and the distribution of seedless cultivated plants such as the sweet potato, taro, banana, and breadfruit, testify to extensive and sustained human communications and migrations throughout the islands of the Pacific and the Malay region, so that no antecedent improbability attaches to a belief in the dissemination of the cocoanut by man. And yet those who have cherished the theory of ocean winds and currents might still insist on the efficiency of these means of dispersion were it not for the fact that the continent of Australia presents the results of a gigantic and totally negative experiment which could scarcely have been better arranged to test the value of such a hypothesis. The colony of Queensland presents a thousand miles of tropical coast line facing eastward toward the currents which set against it from the innumerable cocoanut islands of the central and western Pacific. And yet in the latter part of the last century Moresby[1] found cocoanuts only where they had been planted at a European settlement, the beginning of a considerable industry in tropical Queensland where the natural conditions have been found very favorable for the present species. As in the time of Dampier, Moresby found cocoanuts in great abundance on the coast of New Guinea, and even on some of the islands in the narrow Torres Straits where a complication of tides, winds, and currents would give great opportunities for the interchange of floating objects. And yet neither here nor in the remaining 3,000 miles of tropical northern and western coasts has the cocoa palm been reported by travelers or explorers as growing spontaneously. Curiously enough, taro was found by Captain Cook wild in North Australia, a possible indication of attempted colonization by an agricultural people. And in view of the fact that large fleets of Malay proas from Macassar had long been accustomed to make annual voyages to the trepang fisheries of Marega, the northern coast of Australia, bringing with them rice and cocoanuts[2] as provisions for their visit of three or four months, it is almost incredible that the nuts did not find their way ashore from shipwrecks, if indeed they were not commonly taken on land by those engaged in drying the trepang.

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[1] St. Pierre's Botanical Harmony, p. 87. (Translated by Hunter, Worcester, Mass., 1797.)

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[1] Moresby, Discoveries and Surveys in New Guinea and the D'Entrecasteaux Islands, p. 7. (London, 1876.)

"In front of Mr. Sheridan's house young cocoanut trees, planted by him as an experiment, are growing vigorously—the only ones, strange to say, to be found in North or East Australia, although they grow on Cocoanut Island, only about 20 miles off Cardwell."

Thirty miles from Cardwell Moresby rescued the remnant of a crew of Solomon Islanders from a boat which had drifted 1,800 miles from Fiji to the coast of Australia in about five weeks.

Nearly a century before the same coast had been scrutinized from a small boat by Captain Bligh and his starving companions. They found empty shells of the cocoanut on Restoration Island and also on a small reef near Sunday Island.

"Many pieces of cocoanut shells and husk were found about the shore, but we could find no cocoanut trees; neither did we see any on the main."

Strangely enough Bligh also found with the cocoanut shells signs of the accidental presence of Polynesians on the Australian coast in the form of a large canoe and an abandoned hut, structures evidently not made by the natives of Australia. (See Bligh: A Voyage to the South Sea, London, 1792, pp. 204, 210, 213.)

With the settlement of this coast by Europeans it has become certain that the stranding of cocoanuts is by no means a rare occurrence, and Hedley well remarks:

"But, if the popular idea were correct, the Queensland beaches should have presented many hundred miles of cocoanut groves to their earliest explorers, receiving, as I can testify they do, abundance of drifted nuts and fulfilling every requirement of soil and climate."

[2] Lang, View of the Origin and Migrations of the Polynesian Nation, p. 56 (London, 1834).

On the Queensland coast the finding of cocoanuts, and even the existence of an occasional "wild" cocoa palm, within recent years is claimed by Hedley,[1] but he agrees that even the eating of the stranded nuts by the natives is no adequate explanation of the complete failure of the species to become established on any of the shores of the continent, and if it be admitted that the absence of the cocoanut from Australia is due to its inability to maintain an existence without the continuous help of man, rather than to the lack of all accidental opportunity to reach the shores of that continent, the probability that its general distribution is the result of human agency is greatly increased. For whatever be the real nature of the difficulty, it is evident that oceanic distribution has proved radically inefficient in the only instance where the factor of fostering human care was eliminated, and this not on an insignificant island but on a continental coast line with a variety of soils and climates, and where subsequent experiment by civilized men has shown that the cocoanut will thrive abundantly.

Rutland[2] has already pointed out that the distribution of the cocoanut in the southern seas "exactly coincides with the extension of the art of agriculture," and he adds the pertinent though not entirely accurate observation:

> . . . If the cocoanut palm was transported from Polynesia to America as a cultivated plant, it would probably be found in cultivation on that continent instead of in a wild state, the ancient inhabitants having made little use of the fruit. Throughout Polynesia the cocoanut was of the utmost importance, as many of the islands would have been uninhabitable without it. If its presence on these islands was due to cultivation, we have in it another important evidence of the colonization of the region.

HUMAN ASSISTANCE NECESSARY.

After his extended voyage among the Pacific islands Pickering[3] published the following opinions combining the results of his own inquiries and the consensus of opinion of resident Europeans:

> With the above exceptions, the useful plants appear to be of foreign origin. The *cocoa palm* is the principal one, and so invariably is its presence attributable to human operations that it has become a guide to the traders in seeking for natives.
>
> Notwithstanding that the fruit is well adapted for floating uninjured over a wide expanse, I have never met with an instance of the cocoa palm having spontaneously extended itself from island to island. Two distinct varieties are recognized at the Fiji Islands.
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> *C. nucifera* throughout the Pacific occurs only on those islands to which it has been carried by the natives, a fact well known to traders; was observed by myself only under cultivation throughout the islands of the Pacific and the Malayan archipelago.

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[1] Memoir III, Australian Museum, Sydney, p. 22 (1896).

[2] Trans. New Zealand Institute, vol. 29, p. 13 (1896).

[3] Races of Men (London, 1863), and Chronological History of Plants (Boston, 1879).

Recent testimony is no less definite and emphatic:

> It is to be emphasized that all cocoanuts are *planted;* the idea of a wild palm being as strange in Funafuti as that of a wild peach might be in England. Gill, in describing the primeval forest of the uninhabited island of Nassau in 1862, alludes to but one cocoanut tree among the indigenous vegetation. I doubt whether, despite popular opinion to the contrary, a wild cocoanut palm is to be found throughout the breadth of the Pacific. Certainly it is most rare, again contrary to popular theory, for a drifted cocoanut thrown upon the beach by winds and waves to produce a tree. So intimately is this palm now associated with native life that it is difficult to imagine an atoll before its introduction.[1]

That the Polynesians were not accustomed to expect cocoanuts on uninhabited islands is further indicated by the existence of a myth[2] in which the progenitor of the inhabitants of Humphrey Island, to the northward of the Society Group, is said to have introduced the cocoa palm by planting a nut picked up at sea. The Marquesas islanders believed that the cocoanut was introduced from the eastward by one of their gods.[3]

To these testimonies may be added the statements of Woodford,[4] who made a careful investigation of the conditions existing in the Solomon Group.

> Many of them have small patches of cocoanut trees, a sure sign of frequent native attention, as, from repeated observations, I am convinced that cocoanut palms will rarely grow, and certainly will not bear fruit, unless attended to and kept clear of overgrowing trees.
>
> Cocoanuts are an infallible sign of present or recent habitation. When cocoanuts are left to themselves the young trees become speedily choked by the bush that grows up round them and can consequently bear no fruit, so that, as the old trees die, there are no young ones to replace them.

In his general discussion De Candolle appears to have given considerable weight to the fact that several botanists have reported the cocoanut as growing wild in the East Indies, while only Seeman claims to have seen it in that state in America. But such reports of the finding of cultivated species in the wild state can easily be taken too seriously. There are all gradations between plants which exist only in cultivation and those which are able to escape and establish themselves with the smallest opportunity. In the Tropics the distinction between wild and cultivated often quite fades out, and especially with trees, since these are generally so much more permanent than the traces of human habitation, while at the same time the botanical collector usually has little time and less skill for finding the latter. Throughout the moist Tropics it is possible, for instance, to find wild bananas—that is, bananas growing without human assistance. And yet the banana is seldom, if ever, able to establish itself as a wild plant in tropical lowlands, for the reason that wherever it will grow shrubs and trees will also thrive and choke it out in a few years. The case is much the same with the cocoanut, except that in the course of a century the signs of human agency would more effectively disappear. It is not sufficient to find cocoa palms far from existing human habitations; the question is whether the species could really maintain itself without human assistance and protection against other vegetation. Obviously this can not be determined by simple inspection, but a satisfactory experiment might require careful records carried over at least two or three generations of men and palms. The probabilities are, however, overwhelmingly against the continued independent existence of the cocoa palm at sea level anywhere in the moist Tropics. It is true that if planted by man it will grow in many places where it would never plant itself, and it might also maintain itself in places where the proper conditions were continued by human agency. In undisturbed nature, however, the extermination of the cocoanut by the encroachment of the tangled masses of vegetation which invade tropical beaches would probably require but a few centuries. This idea is recognized in the Cingalese proverb, "The cocoanut will not grow out of the sound of the sea or of human voices," and in the belief held among the same people that the trees will not thrive unless "you walk and talk amongst them."

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[1] Hedley, Memoir III, Australian Museum, Sydney, p. 22 (1896).

[2] Gill, Myth and Songs from the South Pacific, 72 to 74, quoted by Guppy, Journ. Trans. Victoria Inst., vol. 23, p. 46 (1889–90).

[3] Porter's Cruise in the Pacific Ocean, vol. 2, p. 54 (Philadelphia, 1850).

[4] "A Naturalist among the Head-Hunters," pp. 194, 210 (London, 1890).

Although the cocoa palm furnishes an extreme instance, this requirement of open ground is not peculiar to it, but is general in this entire natural order, the members of which, with the exception of the climbing genera, are unable to survive under genuine jungle or forest conditions. The large, long-leaved species are particularly at the mercy of tangled tropical vegetation, since it is impossible for them to make the rapid growth necessary to keep up with trees of other plant families. The arboreal palms are first required to produce a long succession of leaves at the level of the ground, their trunks making no upward growth until the full diameter has been reached, which seldom requires less than three years. On completely barren islands[1] seedling cocoanuts might continue to flourish, but if the space

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[1] Dr. Treub has reported (Ann. Jard. Bot. Buitenzorg, vol. 7, p. 217, 1888) the finding of a cocoanut on the beach of an island formed by the eruption of Krakatoa, but no intimation is given that it had germinated or was alive.

The very small and remote Keeling Islands of the Indian Ocean offer, perhaps, the most probable instance of spontaneous occupation by the cocoa palm, but even here the assertion of the absence of human agency is limited to the denial of "permanent inhabitants" earlier than the nineteenth century. Moreover, there seems to have been but one other arboreal species (*Cordia subcordata*) which has become numerous, and this was confined to the interior of the islands, leaving the coast districts to the uncontested monopoly of the cocoanut. These islands have been studied by Darwin, Forbes, and Guppy, and the last mentions (Journ. Trans. Victoria Inst., vol. 24, needed by the expanding leaves has been completely occupied by other trees and tangled vines the palm remains stunted and finally dies. This disability limits the palm in nature to more open situations, where unimpeded upward growth is possible through the absence of a dense covering of other vegetation. Sandy and rocky countries, exposed mountain tops and shores, the banks of rivers and smaller streams, are the favorite localities of palms. It is also of interest to note that the cocoanut is seldom or never associated with wild native palms, even in the coast regions where it is most abundant. Moreover, contrary to the statements of some writers, it does not appear that the other species of Cocos and allied genera show any tendency to littoral habitats. The African oil palm seems more nearly to resemble the cocoanut in this respect; but it is distinctly more tolerant of forest conditions, and in West Africa thrives in inland situations where the cocoanut fails to make even a respectable beginning. And although seldom regularly planted, the distribution of the species is obviously due in large measure to human agency. The seeds are scattered in large numbers in the open areas about native villages and farms. The young trees are spared by the natives when other vegetation is cleared away, both because of their utility and because they are difficult to cut, and they are able to resist fires which are fatal to most of the local plants. As a result oil palms are abundant in localities where the native populations are sedentary and large enough to require frequent clearing of the land for agricultural purposes, but rare or entirely wanting where the natives move about or are so few as to permit the renewal of forest conditions between the periods of agricultural use of the land. But the oil palm, with its much smaller and less delicate seed, has almost infinitely greater possibilities of maintaining an independent existence than the cocoanut, which, with over three centuries of opportunity, is not showing any remarked tendency to make a spontaneous extension of its range in West Africa.

In fact, among all its relatives the cocoa palm seems to be peculiarly ill adapted to maintain an existence at low elevations in the Tropics. Young trees have comparatively few leaves, and these are large and open and do not effectively shade and occupy the ground like the large and densely packed leaf crowns of Elaeis or Acrocomia. The latter palm is able to increase in the pasture lands of Porto Rico because of the protection afforded by its large needle-like spines, while the young

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p. 290, 1890–91) numerous widely distributed littoral species which had not yet become established on the island, although viable seeds were frequently cast up by the sea. The inference, accordingly, seems warranted that the vegetation of these islands is of relatively very recent origin, and that the cocoa palm was able to flourish because it arrived in advance of the species which otherwise might prevent its becoming established.

tops of the cocoanut are not only unprotected, but are apparently relished by cattle, against which nurseries and young plantations must be fenced

The presence of the cocoa palm only about actual human habitations and its complete absence from the forests of Guatemala is brought forward by Stoll[1] as a reason for denying the existence of the species among the Indians by whom many of the now wooded areas were formerly thickly populated. It is evident, however, from what has already been said that such an inference is quite unwarranted. Whatever might be the possibilities of the cocoanut if cast up on a newly emerged volcanic or coral island, it may be accepted as certain that it can not withstand unassisted the competition of an ordinary tropical flora of vines, shrubs, and trees. Such arguments as that of Stoll prove, in fact, too much; for few things can be more certain than that many settlements have been made and abandoned in the coast districts of Guatemala within the last four centuries, and the complete disappearance of the cocoanuts, if a fact, furnishes emphatic testimony to the dependence of the species upon man, but gives us no inkling concerning its presence or absence among the pre-Columbian Indians of this or any other region.

THE ORIGINAL HABITAT OF THE COCOA PALM.

But if the littoral distribution of the cocoanut is the result of human effort, where did the natural development of the species take place? The literature of tropical agriculture abounds in statements to the effect that the cocoanut is strictly a shore plant, and the botanist Spruce, one of the ablest students of palms, held this opinion and believed in a Pacific origin.

> The cultivation of the cocoanut is limited to the regions bordering the Atlantic and Pacific oceans. As we ascend the Amazon it gradually becomes sterile. At Manaos, 800 miles up, the fruits appear fully formed externally, but are invariably empty. At San Carlos del Rio Negro, almost exactly midway between the two oceans, there were, in 1854, two well-grown cocoa palms which had never even flowered.[2]

Nevertheless, it is now well known that many plants which were formerly supposed to belong strictly to the strand vegetation of oceanic coasts are also to be found in elevated regions. Thus Schimper has shown that in Java many strand species reappear on the volcanic mountains of that island, though absent from the intervening forest belt. Though this possibility seems never to have been considered, there is nothing violently improbable in the idea that the original home of the cocoanut was in some of the sheltered valleys of the equatorial Andes where elevation moderated and equalized the temperature, and the volcanic soil furnished the alkalinity which the species apparently finds congenial on the seashore, and which it is unable to obtain in inland localities having a heavy rainfall. The cocoanut resembles the date in this preference for alkaline soils, but differs in being much more sensitive to extremes of temperature.

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[1] Guatemala, p. 117, (Leipzig, 1886).

[2] Journ. Linn. Soc. London, vol. 11, p. 80 (1871).

The limited distribution of the great majority of the species of palms has already been remarked, so that there is nothing exceptional in the supposition that the cocoanut may have remained confined to a very small area until it made its way to the coast and was exploited by man as one of the few useful strand species.

And notwithstanding the general opinion to the contrary, the cocoanut is not an exclusively littoral or sea level species. It flourishes, for example, at Bangalore, in the middle of the southern part of the Hindostan Peninsula, nearly 200 miles from the coast, and at an elevation of nearly 3,000 feet. In the region of the Ganges and Brahmaputra it has been carried inland 150 or 200 miles, and even to Patna and Lucknow, though at the latter place the nuts are said not to ripen. Pickering's "Races of Men" furnishes a statement that in semiarid Arabia the cocoanut is cultivated "in the interior country back of Muscat." According to Dr. Edward Palmer thousands of cocoanut palms are grown in the dry and somewhat elevated region about the city of Colima, Mexico, and it has also been reported at Merida, Yucatan. In none of these places, however, is there any indication that the tree is indigenous, and according to Seeman numerous unsuccessful attempts have been made to grow it in the central parts of the Isthmus of Panama. But it is in South America, the home of all the other species of Cocos, that we find the greatest probability of an indigenous inland existence of the cocoa palm. Cieza de Leon described in the first half of the sixteenth century palms from this region which may have been cocoanuts:

> The site is 23 leagues from the city of Cartago, 12 from the town of Anzerma, and 1 from the great river, on a plain between two small rivers, and is surrounded by great palm trees, which are different from those I have already described, though more useful, for very savoury palmitos are taken from them, and their fruit is also savoury, for when it is broken with stones milk flows out, and they even make a kind of cream and butter from it, which they use for lighting lamps.

Probably because of the general belief in the strictly littoral distribution of the cocoanut Markham has conjectured that this statement refers to *Ceroxylon andicola*, a palm which Humboldt reported from the region of Cartago, but which grows on high declivities, not in the river plains. Moreover, it is the waxy secretion of the trunk of Ceroxylon which is burned, not a cream or butter made from a milk-producing fruit. The apparently unnecessary statement that "their fruit is also savoury" doubtless implies a reference to the pixiuare palms (Guilielmia?) of which the outer layer or husk is fleshy and edible, not the kernel as in the cocoanut. Cieza de Leon also described numerous small lakes, springs, and pools of salt water in the Cauca Valley between Antioquia and Popayan, but especially at Cartago.

But the final testimony to the existence of the cocoanut palm in the interior regions of Colombia is that of Humboldt, who in giving an account of the finding of healthy and vigorous trees at Concepcion del Pao, Venezuela, a station about midway on his journey between Barcelona and Angostura, declares that he and Bonpland also saw "fine cocoa palms" repeatedly during their travels in the upper part of the valley of the Magdalena River of Colombia, 100 leagues from the coast.[1]

As already stated, the derivation of the varieties of the cocoanut by human selection has taken place in the Malay region, and not in America. It is, however, known that the cocoanuts shipped from the Colombian port of Cartagena are far superior to others produced in America, and apparently they also exceed those of the East Indies in thickness and quality of flesh, so that they are greatly preferred for confectionery purposes. This fact may have both theoretical and practical importance, since it suggests the possibility that, in spite of universal opinion, the cocoanut may be not only an inland species, but that it may actually have suffered deterioration through long cultivation in an unfavorable habitat.[2] The thicker meat of the Colombian nuts is a suggestion in the direction of having the kernel fill the shell, the normal condition in all related palms. In fact, it is very difficult to understand why the cocoanut should have carried the development of the shell so far beyond the needs of the kernel. If the wild ancestral type of the cocoanut still exists in the mountains of Colombia we may find that its flesh, if not solid, is at least thicker and more highly flavored than that of any coast-grown nuts, and that the seed for new plantations should be obtained from the wild, instead of from the too-long domesticated stock.

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[1] Humboldt and Bonpland's Reise, vol. 3, p. 212 (Wien, 1830). Seeman's version of the same note (Popular History of the Palms, London, p. 155, 1856) differs substantially in omitting the statements regarding the healthy condition of the palms in these interior localities.

[2] Though romance and poetry have always linked together reef and palm, yet truth to tell, the cocoanut does not attain its greatest luxuriance upon the low reef islands. To an eye, not to mention an appetite, accustomed to the cocoanuts of New Guinea, the fruit of Funafuti seems to be dwarfed and stunted, and the palm trunks to be small and slender. A hundred nuts on a stem is a maximum yield for Funafuti, but double that amount is obtained elsewhere. "As big as a Rotumah nut," is a phrase often heard upon Funafuti, the richer soil of that high island producing larger nuts than the atolls; the shells of very large nuts being valued for flasks and toddy vessels.—C. Hedley, Australian Museum, Sydney, Memoir III, pt. 1, p. 23 (1896).

THE DIRECTION OF THE TRANSPACIFIC DISTRIBUTION.

In addition to the testimony already noticed as indicating a rather recent arrival of the cocoa palm in the Indian Ocean, the probabilities of a westward rather than an eastward distribution of the species are strongly suggested by an argument brought forward by Seeman[1] as favoring a Polynesian rather than an Asiatic origin. The Polynesians, like other aborigines of the tropics, are fond of fermented drinks, but they are quite unacquainted with the use of the sap of the cocoanut or of other palms for this purpose, and, like the aborigines of the American tropics,[2] they have recourse to infusions of roots in which fermentation has been induced by preliminary mastication in the human mouth. In the Malay region and in tropical Asia this custom seems not to exist, the juices of several Asiatic palms having furnished from remote times the basis of fermented drinks and a variety of other useful substances. Even the word "toddy" has been traced back to the Sanscrit without change, though scholars prefer to write it *tade*.

> Had the Polynesians, therefore, once known the process, they would probably never have forgotten so easy a way of obtaining sugar, vinegar, yeast, and a pleasant drink, the strength of which may be regulated by time to any man's taste. So either the Polynesians could never have come from Eastern Asia, or else, after spreading over the South Sea, ages must have elapsed before the cocoanut made its appearance in those waters, so that the process of toddy making (there being no other suitable Polynesian palm to operate upon) had been entirely forgotten, and even disappeared from native traditions.

This amounts to the proposition that if the Polynesians originated in Asia they left that continent before the invention of toddy, and before the cocoanut came into use, or at a period so remote as not to correspond to the current supposition that the Polynesian occupation of the Pacific is a matter of a few centuries only.[1] Seeman had already dismissed the idea of an American origin of the cocoa palm, but finding it unreasonable to believe that both the Polynesians and the cocoanut came from Asia, he was impelled to raise the question whether the direction of the Polynesian migration has not been misinterpreted.

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[1] Flora Vitiensis, p. 276 (London, 1865–73).

[2] To a very limited extent use was made in America of the juice of palms. In Central America wine was made from the juice of Acrocomia. That this was an indigenous and not an introduced custom is indicated by the fact that Acrocomia is a strictly American genus, and that, although it extends from Mexico and Cuba to Brazil and Paraguay, the drinking of its juice seems to have been localized in Central America in regions where one of the species, *A. vinifera*, is said to be extremely abundant. That the custom was truly aboriginal and not brought from the Philippines by Spanish agency is also proved by the fact that it was observed by Columbus on his fourth voyage. Moreover, the palm was not tapped in the Asiatic manner, but the juice was squeezed from its pith, necessitating the destruction of the tree.

In Colombia, Humboldt describes the natives as securing wine from *Cocos butyracea* by felling the trees and excavating a cavity in the upper part of the trunk, in which the juice continued to exude for eighteen or twenty days.

The art of collecting tuba, as now practiced in Mexico, is believed to have been introduced from the Philippines at a comparatively recent period.

> The light-skinned Polynesians are assumed to be of a Malay stock, and to have migrated somewhere from Eastern Asia. . . . Did these Polynesians leave the cradle of their race before the cocoanut tree had found its way to it? Or are we to assume that they have migrated with the trade wind rather than against it; that Malayan Asia was peopled from Polynesia rather than Polynesia from Malayan Asia?

And even if it be admitted that the Polynesians have never been in Asia, other facts remain which can scarcely be explained except by supposing that the cocoanut also passed from east to west. At the time of Captain Cook's visit Forster found two names at Tahiti connected with the cocoanut palm, *nia* for the fruit and *ari* for the tree. Although this distinction is often lost in the islands to the westward, yet both names in numerous modifications have a very wide distribution throughout the Pacific, the Malay region, Hindustan, Arabia, and Madagascar. The word *nia* becomes *niog* in the Philippines, and in other localities suffers a vast number of other changes, of which the following samples may suffice: nu, niuh, njo, nieor, nieo, niau, nikau, njog, nivel, niwer, niyur, nidjoe, nieh, nicoëra, njioer, noohhoe, and nijor. The other term *ari* is supposed to be represented in various Polynesian groups by haari, hari, erei, and akari, and has been conjectured to be the original of the Maori *kakari*, and may well be the root of the Arabic *harel*, and the extremely numerous Hindustan forms like nari, naril, narel, narjil, nardjil, and narikel. It can scarcely be denied that the existence of such series of names, when used for the same product by peoples separated by thousands of miles and differing totally in racial characteristics, languages, and customs, affords another proof that the cocoa palm was not distributed by the waves, but by human beings engaged in colonization or commerce.

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[1] This idea has undoubtedly been fostered by the fact that the occupation of many of the small coral islands and groups of the Pacific is obviously recent, as must, indeed, be the case where the land itself has existed for only a few centuries. Thus islands of the Ellice Group, to the north of Fiji, were settled in historic times from the Gilbert Group, still farther to the north. It is also of interest to note that the cocoanuts are also known to have been introduced from the north and that the natives make toddy and do not use kava, facts which are used by ethnologists to show that the people of the Gilbert Group were derived from Micronesia and not from Melanesia or Polynesia. According to Captain Moresby the Papuans of the coasts and islands explored by him in 1873 used neither toddy nor kava.

"We never saw any intoxicating drink among the Papuans, and were struck by the peculiarity, as the making of ava is general amongst the South Sea Islanders." See Moresby, Discoveries and Surveys in New Guinea and the D'Entrecasteaux Islands, p. 324. (London, 1876.)

The differentiation of the names both in number and complexity is from east to west, and in the Viti (Fiji) Islands we have an additional indication that the people who brought the name had been acquainted with the cocoanut before they met with the several other species of palms indigenous in that group of islands. This is inferred from the fact that although the name *nia* applies especially to the nut rather than to the tree among the Polynesians, it is used by the Melanesians of Viti as a generic term to include all the local palms. The tendency of primitive races generally is to have separate names not only for each species, but for varieties and parts of useful plants, and according to Seeman the Fijians are "the only people who in their barbarous state had a collective term for the palms." But that the name elsewhere applied only to the cocoanut was employed for this generic use can scarcely mean anything else than that the cocoanut was known and named before the other Vitian palms were encountered. For if we think of the original Vitians as aboriginals of their own islands they should be expected to have had separate names for their palms as for other indigenous plants, and the cocoanut, if introduced by natural or accidental means, would, at the most, have received the name of one of the native species. But that the palms of Viti should all be designated as different kinds of *niu* or cocoanuts can scarcely be interpreted in connection with the general distribution of that name except as indicating that the people who brought the name *niu* to Viti were already familiar with the cocoanut, but had not come in contact or, at least, had not given names to other Pacific palms until they reached Viti, where the Malayan palm flora begins to make its appearance. In Samoa, the first archipelago to the east of Viti, where the name *niu* is also used for the cocoanut, there are only two indigenous palms, and these are apparently so rare and unimportant that they have received no native names.[1] In Viti, however, Seeman found twelve indigenous palms, several of which grow at comparatively low elevations and are used for timber and other economic purposes. There is even a native sago palm, *Sagus vitiensis*, but this was also called *niu* (*niu soria*), a fact further at variance with the idea of an emigration from the Malay Archipelago, where the sago palm furnishes so important an article of diet. Strangely enough, Seeman found on one of the Viti islands another name, *sogo* or *songo*, evidently contributed by the Melanesian or Papuan constituent of the population of Fiji, but as a name merely, the art of extracting sago being unknown in Fiji until taught by Seeman.

These facts taken together seem to furnish the hitherto missing clue to the origin and direction of the migration of the race which brought the Malayo-Polynesian language, the cocoanut, the sweet potato, the yams, and other American food plants into the Pacific; the race which was at one time powerful enough to impress its language, social organization, and domestic arts upon the black Melanesians, who subsequently absorbed their conquerors and formed with them the remarkable composite peoples found by Europeans in the Pacific. The differentiation of the cocoanut varieties, together with the ethnologic differentiation of the Pacific peoples themselves, give us time factors ample for the subsequent Asiatic amalgamation and development of the Malayoid races, which doubtless received great stimulus from the experiences of such a migration and may have had a wide influence in the organization of the primitive civilizations of Asia, even far beyond the boundaries of direct power or physical contact. Traces of such influences far within the mainland of Asia have been interpreted by anthropolgists as meaning the Asiatic, and even the Caucasic, origin of the primitive Polynesians; but all such arguments from philology and racial characteristics, after all, only prove the relations, and do not declare the nature of the contact or the direction of the primitive migrations. Cultivated plants, on the other hand, are definitely recognizable, permanent, and unmistakable entities on which human civilizations depend, and from which civilized man can not detach himself. Even the substitution of food plants is an extremely slow and difficult process, often necessitating profound social and economic changes, and leaving traces for centuries in language and daily life.

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[1] Reinecke, Die Flora der Samoa-Insel, in Engler's Bot. Jahrb., 25, p. 588 (1898).

SUMMARY OF DE CANDOLLE'S ARGUMENTS.

In attempting to displace De Candolle's time-honored opinion it is perhaps desirable to go over in brief detail his formulated arguments. These are twelve in number, two in favor of and ten against an American origin. The first of the favorable considerations has been noticed already—the existence of the eleven other American species of Cocos. The second is that the trade winds of the equatorial region of the Pacific would tend to carry floating objects to the westward. This is offset in theory, as it might be in practice, also, by the first of the negative arguments, that the currents of the equatorial Pacific would carry objects in the opposite direction, or from west to east. The second objection to an American origin is the fact that "the inhabitants of the islands of Asia were far bolder navigators than the American Indians," rendering it more likely that they would be carried by "tempests or false maneuvers" to the American coast. The eastern part of the equatorial Pacific is, however, notoriously free from storms, and the seafaring skill of the islanders, together with the above mentioned westerly trade winds, would have tended to protect them from the disasters suggested. Instead of being dependent upon accident and conjecture we have historical evidence that the Peruvians knew the location of inhabited islands in the Pacific, information probably obtained from some of the conquered races of the coast region.

The third point is the greater area of distribution in Asia, which proves only that the cocoanut was more appreciated there than in America. The next three counts are on multiplication of varieties, uses, and names in Asia, which have already been touched upon.

In the next objection it is considered improbable that "the ancient Mexicans and inhabitants of Central America would have neglected to spread the cocoanut in several directions had it existed among them from a very remote epoch." It has been shown above that the species might have been American and still, like most other palms, not widely distributed. Moreover, there is no evidence of extended movements among the aboriginal peoples of tropical America. The more recent of the superior tribes were of temperate origin, and even the cacao of tropical Mexico and Central America had not been exchanged for the cocoa of tropical Peru, plants far more valued than the cocoanut. Under number eight it is alleged that if the cocoanut had been present in America before Pliocene or Eocene times it would have been found on both sides of the continent, a point which the evolution and distribution of other palms does not indicate to be well taken, or to have bearing upon the question. The ninth objection is that there is no record of ancient existence in America, while Sanskrit names indicate its presence in Asia three thousand or four thousand years ago. This seems to be due to the literary backwardness of the American aborigines and is no fault of the palms. The tenth and final item is based on the wide diffusion of similar names among the Malays and others, but it has been shown that the names indicate a westerly and not an easterly direction for the trans-Pacific journey.

CONCLUSIONS.

It thus appears that among De Candolle's ten reasons for the Asiatic origin of the cocoa palm none is based on facts incompatible with the present view that the species originated in America.

An introduction of the cocoa palm to America by the Spaniards in the fifteenth century is highly improbable by reason of the difficulties of securing and transporting living nuts from the Far East, with which the Spaniards were not in communication, and there are neither records nor traditions establishing or even suggesting such an introduction.

The existence of the cocoanut in great abundance in Central America in the early years of the sixteenth century is established by the extended and circumstantial record of Oviedo, supported by the testimony of Cieza de Leon, Acosta, and Hernandez, all of whom evidently considered it an indigenous American product.

The reported introductions of the cocoanut during the sixteenth century to Jamaica, Guiana, Brazil, and West Africa afford no indication of importations from Asia, but are much more satisfactorily explained on the supposition that the nuts were brought from Central America.

No other genus or species of palms is common to America and Asia or the Polynesian Islands. The Asiatic origin of the cocoanut would therefore be an anomaly of distribution for this entire order of plants and is thus, from the botanical standpoint, highly improbable.

The distribution of the cocoanut in the Pacific and Indian oceans was not, however, a unique achievement for man, but was also accomplished with numerous seedless varieties of the sweet potato, taro, breadfruit, and banana; the last having been introduced also into tropical America in prehistoric times. Numerous tropical economic plants, including the sweet potato, bottle gourd (Lagenaria), true gourd (Cucurbita), cowhage (Mucuna), yam bean (Pachyrhizus), and one or more species of true yams, all probably of American origin, existed in Polynesia and in the Malay region in prehistoric times.

Although the derivation of numerous varieties of the cocoanut in the Malay region implies long existence in that part of the world, there is both traditional and historical evidence of a comparatively late arrival in Ceylon and in the western part of the Indian Ocean.

The generally accepted theory of the distribution of the cocoanut by ocean currents is not supported by direct evidence. At the same time, the cocoanut, as a seed, is delicate and short-lived, and special conditions and care are required for successful germination and the growth of vigorous seedlings.

The cocoa palm is found in the Pacific and elsewhere only on inhabited islands and coasts, and is unable to maintain an existence when subjected to the competition of the wild vegetation of tropical shores and forests. In the Pacific and Indian oceans the distribution of the cocoa palm is conterminous with that of agricultural peoples, but the species did not establish itself anywhere on the extensive tropical coast line of the Australian continent, the aborigines of which were non-agricultural.

Contrary to general opinion, the cocoa palm is not confined to the seashore or to the sea level, but has been found to thrive in several elevated inland regions where the soil conditions are favorable, and where temperatures are moderate and equable. The original habitat of the cocoa palm is to be sought in South America, the home of all the other species of Cocos and of most of the closely related genera. More specifically, the probabilities favor the alkaline regions of the Andes of Colombia, where it has been reported by Cieza de Leon and Humboldt in valleys remote from the sea.

The failure of the Polynesians to use the juice of the palm for toddy and other purposes indicates the improbability of a migration from Asia, while the Polynesian method of making fermented drinks from masticated roots agrees with the custom of the natives of tropical America.

The agreement and distribution of the Polynesian, Melanesian, Malayan, and other Oriental names for the cocoanut indicate a westward migration for the race which introduced it in the western Pacific.

The ethnological facts which have been thought to prove an Asiatic origin for the Polynesians can be accommodated by the supposition of a westward migration of a primitive culture race to the Malay archipelago and the Asiatic continent.

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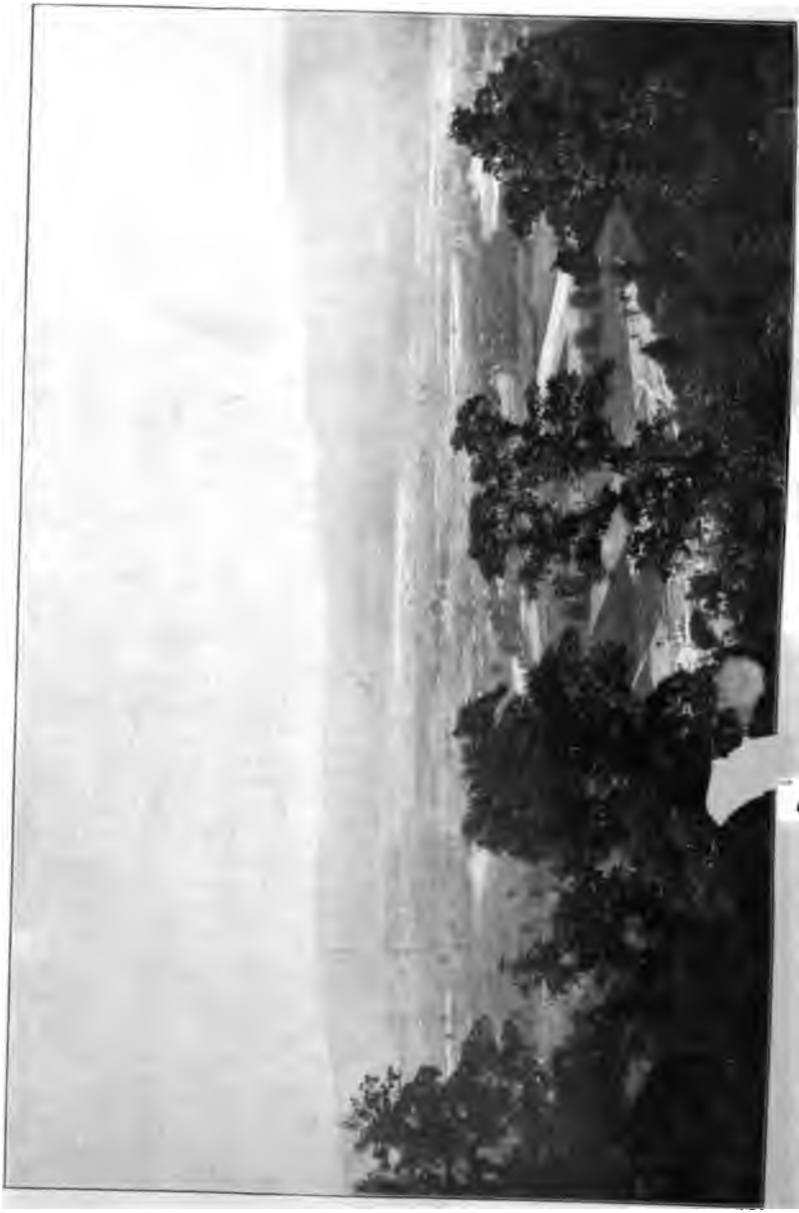

ROU 'ALLEY, MENDOCINO COUNTY, CAL.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

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THE U. S. NATIONAL HERBARIUM.

Vol. VII, No. 3.

PLANTS USED BY THE INDIANS OF MENDOCINO COUNTY, CALIFORNIA.

BY

V. K. CHESNUT.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Division of Botany,
Washington, D. C., June 29, 1901.

Sir: I have the honor to transmit herewith, and to recommend for publication as Contributions from the United States National Herbarium, Vol. VII, No. 3, a manuscript entitled, "Plants Used by the Indians of Mendocino County, California," prepared by Mr. V. K. Chesnut, assistant in the Division of Botany.

Respectfully,

Frederick V. Coville,
Botanist.

Hon. James Wilson,
Secretary of Agriculture.

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PLANTS USED BY THE INDIANS OF MENDOCINO COUNTY, CALIFORNIA.

INTRODUCTION.

While in California during the summers of 1897 and 1898, and incidentally in the summer and winter of 1892, the writer had opportunity to make some inquiry into the native uses of plants in the Round Valley Indian Reservation, and in July, 1897, similar inquiries were made at Ukiah. Both of these places are in Mendocino County, which stretches as a band 60 miles broad for 84 miles along the coast, about midway between San Francisco and the northern border of the State.

The floras of these two regions, although they are only 42 miles apart, differ considerably, and both vary a little from that of the redwood belt of the immediate coast line, about 40 miles distant. This third belt was not visited by the writer; but inasmuch as there are few, if any, Indian tribes in the county which are not represented in the reservations or at Ukiah, and since, moreover, many of these visit the coast occasionally, this report may be taken to be fairly representative for the county.

At as late a date as 1849, Round Valley, which is near the northern end of the county and about 200 miles north of San Francisco, was unknown to white men, being then inhabited by a peculiar tribe of very uncommunicative and warlike people, the Yuki, and it was not until 1856 that white people began to settle there. The Yokia and Pomo Indians, who lived in the immediate vicinity of the now flourishing town of Ukiah, were well known at a much earlier date; but it has been since 1880 only that the California Northwestern Railway was extended to the town, which is still the terminus of the road. Connection with Round Valley, which by the compass is 42 miles north of Ukiah, is made by stage over a very circuitous mountain route by way of Laytonville, or by private conveyance over a poorer but more direct road by way of Eden Valley.

Since the Round Valley Indians, the Yuki, have become known to civilization only within the last half century it was thought that a study of their uses of plants would yield better results than would be obtained by a study of the more southern Pomo and Yokia tribes. In 1897, therefore, inquiries were made during July and August in

Round Valley only. Experience proved, however, that these Indians, on account of educational facilities and the generally elevating tone of reservation life, were more civilized in many ways than the Indians near Ukiah; and for this reason, in 1898, in addition to five weeks spent in May and June in obtaining fresh data at Round Valley, two weeks were spent in June and July in making inquiry near the latter place. Although 1898 will long be remembered in California for its drought, rain fell copiously in Round Valley the last week of May, and snow was observed for nearly a week on the tops of the surrounding hills. These particular regions were, indeed, but little disturbed by the drought, and the writer was enabled to collect a very considerable number of plants which were either not mentioned, or were but imperfectly described, by the Indians in 1897.

The present Indian population of Mendocino County may be roughly estimated at from 1,500 to 2,000. It is but a feeble representation of the many thousands which at no very remote period covered the entire region and lived solely upon its native resources. Food was so abundant in any given locality here, and in fact in many other parts of California, that it was not necessary for the Indians to wander long distances for it, as was the case elsewhere in the United States, especially on the Great Plains, where wide areas were inhabited by a single tribe.

In so far as the same plants were to be found in the various districts mentioned above, they were, as may be seen by a comparison with Powers' comprehensive report,[1] used in very similar ways; but since California has different climates even in closely contiguous areas, the native plants vary greatly in these regions, and consequently many of those used by one tribe were totally unknown to others. Numerous tribes were therefore developed, and even in closely adjoining valleys, only 15 to 20 miles apart, it is recorded that people could be found with very distinct dialects. A glance at the maps published by the United States Bureau of Ethnology readily shows the wide diversity of peoples in the State of California. Each tribe, accordingly, was subject to a certain limited environment. Those nearer the sea were extensive flesh eaters, but the oil and fats necessary for the animal economy which were thus supplied were replaced in the interior by oily acorns and oily seeds of many kinds. Sea salt was in like manner replaced by the ash of certain wild plants (*Petasites* and *Mimulus* spp.) which grew in the interior of the county. Each tribe learned its own plants most thoroughly.

At the present time, however, a few tribes only are found in their native homes. Among those visited by the writer the Yuki, Pomo, and Yokia were so situated, and these tribes were therefore studied most closely. The Concow were removed from east of the Sacramento Valley to Round Valley, while the Wailaki and Numlaki were brought into the reservation from the northern part of the State. The Pomo includes several distinct tribes, such as the Little Lakes, Calpellas, and Potter Valleys, but their languages and plant uses are nearly the same.

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[1] Powers, Stephen, Tribes of California. Contributions to North American Ethnology, vol. 3, pp. 635 to 640. 1877.

The method of inquiry which the experience of 1897 proved to be most satisfactory was first to make a fairly complete set of the native plants, and then to take notes on these from representative Indians, refraining as far as possible from asking questions which would lead to an expected answer. By allowing the Indians to do most of the talking, and checking by means of printed blanks the information given by a dozen or more Indians about a single plant, it is hoped that the truth was generally obtained.

Some of the notes here recorded are of no particular economic value, but are worth preserving to show how the natives subsisted in former times. Their free use of nearly all kinds of roots, stems, leaves, and seeds is not only very interesting, but a knowledge of these and how to prepare them for food or medicine may easily be the means of sustaining the life of persons who are obliged to traverse long distances or take long perilous trips where such plants or closely related ones abound. Several, such as manzanita, for its cider, and yerba buena, furnish grateful beverages. No one, even though perfectly familiar with such plants as the Christmas holly (*Heteromeles arbutifolia*), the bay tree (*Umbellularia californica*), the buckeye (*Aesculus californica*), clover (*Trifolium* spp.), the Brodiaeas, or the tar weeds (various Compositae), would ever imagine that any portion of them were edible; yet these are used in great abundance by the Indians. Some, as the buckeye and the acorn, must be subjected to special treatment before they can be eaten. A study of this manipulation furnishes one of the most important lessons to be gained from the native use of foods. The inventive genius developed by these Indians, as a result of untold years of experience, is truly remarkable.[1] In some ways it is very worthy of emulation, especially in the utilization of these substances in the place of animal food. It is undoubtedly true that much valuable native food is allowed to go to waste. The utilization at the present time of such large quantities of clover and acorns for human food suggests some very interesting problems to food specialists and also to ethnologists. The use of such a bulky diet, having been continued for ages under perfectly natural conditions, must have had a characteristic effect upon their physiognomy and their physical and moral character. Some of the native food stuffs, such as the bay nut and the numerous liliaceous bulbs, might be introduced into our markets or at least into our home gardens for human consumption. Some of the latter would undoubtedly be regarded as delicacies. A comparison of their mode of preparation of acorn bread with the Italian and Spanish methods and the comparative value of the two products would be a very interesting study. Their method of catching fish by means of soap root (*Chlorogalum pomeridianum*), turkey mullein (*Croton setigerus*), and other poisonous herbs, and the real food value of the fish, together with the effect of the poison, also present interesting problems.

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[1] See pp. 334 to 338 and p. 367.

In a similar way medicine has yet much to learn from these Indians. Much of their practice is based, to be sure, upon incantations and the use of sweat baths as taken in their temescals,[1] but it was most probably through the agency of the Mendocino County Indians that the use of cascara sagrada (*Rhamnus purshiana*) was introduced, not only throughout the State, but throughout the United States, where it is an official remedy, and everywhere abroad as a most valuable cathartic. Other plants, not recognized in general practice, are widely used by the natives, and others, such as Ceanothus, which are not yet extensively used, have decided properties, and should be investigated. Among the most important of these are Croton, Eriogonum, and Limodorum.

Most of the information here given was obtained directly from the Indians. The notes published in various parts of Stephen Powers's treatise on the tribes of California were kept in mind and verified whenever possible. Considerable assistance was obtained at Round Valley from the various Government employees, especially the principal of the Round Valley School, Mr. George W. Patrick, and two of the teachers, Mr. and Mrs. W. J. Nolan; from Rev. Colin Anderson, who has served for several years as the spiritual adviser to the several tribes, and from Mr. Frank Youree, of Covelo, an intelligent white man, who has lived with the Wailaki Indians for many years. At Ukiah much assistance was obtained from Dr. J. W. Hudson, who, together with Mrs. Hudson, has made an extended study of the Pomo Indians from the medical and artistic standpoints; and from Mr. Carl Purdy, who is extensively acquainted with the flora of the district, and who employs many Indians to gather wild bulbs for him.

The direct stimulus for the work was obtained from two visits made to these various tribes by the writer in 1892 for the purpose of collecting anthropological and ethnological data for the World's Fair at Chicago in 1893, and from a study of Mr. F. V. Coville's Notes on the Plants used by the Klamath Indians of Oregon, as also his Directions for Collecting Specimens and Information Illustrative of the Aboriginal Uses of Plants, both of which were published by the U. S. National Museum. For assistance in the identification of the plants thanks are due to Prof. E. L. Greene, of the Catholic University, and to others mentioned in the report. The photographs and illustrations were made by Dr. W. L. Jepson and Prof. E. R. Drew of the University of California, A. O. Carpenter of Ukiah, W. J. Nolan, of Weathersfield Center, Vt., and by G. N. Collins, F. A. Walpole, and the author, of this Department. The classified summary showing in concise manner the uses to which the various plants have been put is almost entirely the work of Mrs. V. K. Chesnut.

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[1] See pp. 309, 351, 393.

The diacritic marks used to indicate the pronunciation of the Indian plant names are those employed in the Century Dictionary.

ECONOMIC PLANTS BY FAMILIES.

BANGIACEAE. Seaweeds.

Porphyra laciniata (Lightf.) Ag.

Tō-nē' (Little Lake).—A purple, gelatinous seaweed, 3 to 18 inches long, which grows on smooth stones near the low-water mark on the seacoast. The species was identified by Dr. M. A. Howe, of Columbia University, from crude samples obtained both at Round Valley and at Ukiah. It is collected in considerable quantity by some of the Indians who make special trips to the coast after various sea products, including especially this plant, the abalone (a shell fish used for food and ornament), and a kind of clam the shell of which is extensively used for the manufacture of wampum. The favorite method of preparing the fronds for food is to bake them, but the membranous mass, which is very tough when dry, is often chewed in the raw condition. After thorough mastication, a somewhat tedious process, it becomes mucilaginous and fairly digestible. It is valued chiefly for its salt and for its high percentage of mucilage. The same plant is eaten by the Chinese in San Francisco and the natives of southern Alaska. It is probable that the "marine sauce" served with roast meats in Europe is derived from the same seaweed.

HYPOCREACEAE. Ergot Family.

Clavipes purpurea (Fr.) Fl.

The common ergot, a dense, black, parasitic fungus, which permeates the seeds of various grasses and alters them into elongated club-shaped masses, was found growing rather abundantly on the grains of the wild lyme grass (*Elymus triticoides*) in Round Valley. Its general medicinal use is well known to the Indians. No special name was learned for it.

PARMELIACEAE. Lichens.

Alectoria fremontii Tuckerm.

A few specimens of this black, hair-like lichen were observed growing on pine trees near Round Valley. Mr. Coville, in his report on the Klamath Indians, states that this plant was formerly used by those

Indians for food in times of famine. The same use formerly prevailed among the more northerly tribes, the Wailaki, of Round Valley. It grows very abundantly on the pines and firs of Mount Shasta.

Evernia vulpina (L.) Ach.

Ol-gät'-i (Yuki).—The bright lemon-yellow lichen, known as yellow "moss," which is common on fences, the bark of old trees, and more particularly on decaying logs. It was formerly used to a small extent as a bedding material. A thick decoction was also used in former times by the Yukis as a kind of paint, but no particular use appears to have ever been made of it here for dyeing purposes. It has always been considered very valuable by the Yukis and Wailakis for the purpose of drying up running sores and to relieve the accompanying inflammation. Its value in this regard was well corroborated by Mr. C. M. Brown, the gentleman who had charge of the Indians at the Government sawmill at Round Valley.

Usnea lacunosa Tuckerm.

The common grayish-green lichen which so abundantly drapes the slender branches of the great, wide-spreading valley oak (*Quercus lobata*) adds much to their weird beauty. Under the name of "moss" it is sometimes gathered for use as a bedding material.

LYCOPERDACEAE. Puffball Family.

Lycoperdon sp.

Mē-ēn"-chip"-ä-soi' (Yuki).—The common puffball, or devil's snuffbox, which was observed growing very plentifully on the ground after a prolonged rain storm in May, 1898. All of the Indians disclaim any knowledge of its really edible qualities.

The leathery outer covering of the same or a similar species was seen in 1892 by the writer in the possession of an Indian medicine man, who used it along with other highly prized paraphernalia in his professional outfit. Several skins, each containing pieces of gravel, were securely fastened to a small stick, and this instrument was used to make a peculiar, rattling sound. It is well known that when fully mature the spores of this plant are discharged from its interior in the form of an impalpable, smoke-like powder. It does not seem at all unlikely that this character has led the Indians to look upon it with superstition. The spores are used to some extent to dry up running sores.

POLYPORACEAE. Bracket Fungi.

Polyporus sp.

Kä-lä' chā'-ā (the ch explosive) (Calpella). A wood-like fungus which grows on the base of alder trees and on logs. It was described as being brown on top, white underneath, and hard and smooth all over its outer parts, the inner part being soft and salmon-colored when thoroughly boiled and characteristically arranged in horizontal layers. It appears to be more highly esteemed by all the Indians of this region than any other fungus. A white man who has spent a considerable portion of his life with the Indians informed me that it was very fine eating and that the flavor was very much like that of salmon.

BOLETACEAE. Pore Fungus Family.

Boletus sp.

Kō-o' chū'-ū (the k and ch explosive) (given by a Calpella Indian at Ukiah). A fungus, evidently belonging to this genus, which is white on top and has a white fracture that rapidly turns blue and then black. My Indian informant told me that three white men living near Ukiah were made very sick "several years ago" by eating this plant.

Another fungus, probably a Boletus, for which no special name was given, is eaten raw by the Calpella Indians. It grows in the woods and is yellow on top and green beneath.

AGARICACEAE. Mushroom Family.

Agaricus campestris.

Hī-gat' (Yuki).—The common field mushroom (fig. 66), which is elsewhere universally esteemed for its food value. All of the Indians appear to be somewhat superstitious about eating this fungus, but since they make a practice of selling it to the white people, it is quite probable that they do eat it to a considerable extent. A few of the men expressed the belief that this was the kind that poisoned some white people several years ago.

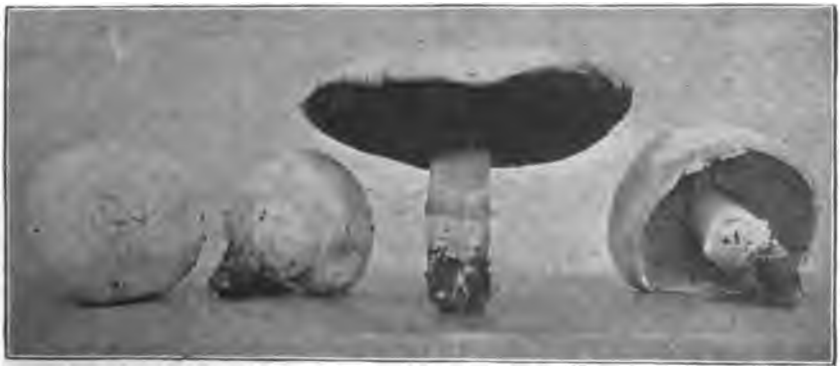

FIG. 66.—Common mushroom, *Agaricus campestris*. Edible. Three-fourths natural size.

Amanita muscaria L.

From the history and symptoms of a fatal case of poisoning of which an old Indian (Tony Laycock) was the victim at Round Valley in 1894, related to me soon afterwards, I judge that this fungus (fig. 67) was the cause of death. Other Indians are reported to have been killed at other times by eating fungi.

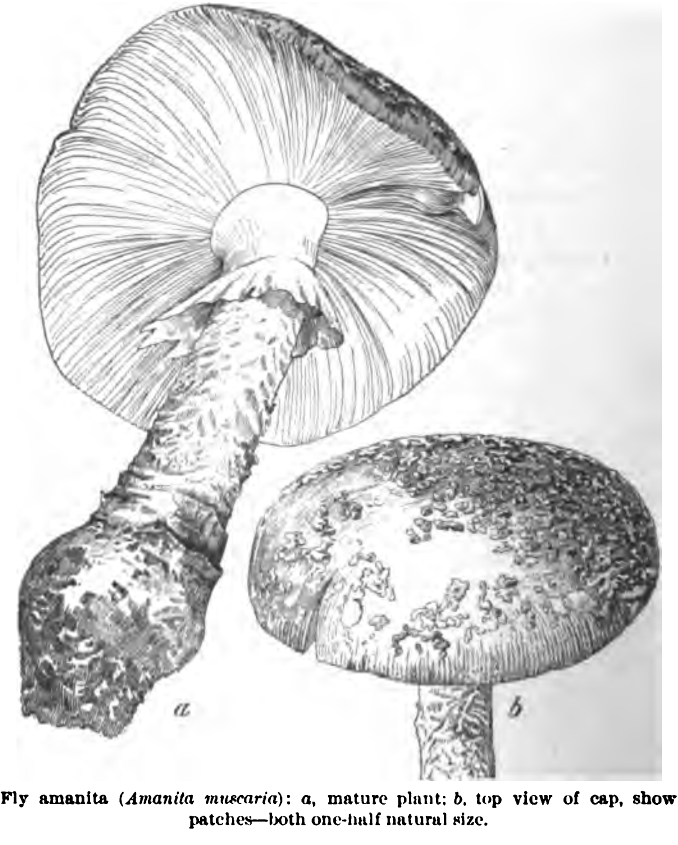

FIG. 67.—Fly amanita (*Amanita muscaria*): *a*, mature plant; *b*, top view of cap, showing corky patches—both one-half natural size.

Kä'-ē (the k explosive) is the Yuki name applied to an edible fungus 4 to 6 inches in diameter, which was described as growing on the ground in scattering forests of oak and madrone trees, and as having white gills.

BRYACEAE. Moss Family.

Alsia abietina (Hook.) Sullivan.

Kä-lā' kö'-chē (Little Lake).—A green fern-like moss, 3 to 5 inches high, which almost completely covers the northern side of all the forest trees of the region. It is valued chiefly as a bedding material, especially for babies.

POLYPODIACEAE. Fern Family.

Adiantum emarginatum Hook.

Shmu-chwâk' kä-lā' (Yokia).—The common maidenhair fern, which grows from 8 to 12 inches high on brushy hillsides throughout the district. *Shmu* means ear, *chwâk* is equivalent to stick, and *kä-lā'* is the word for tree. The plant is literally the "ear-stick tree." The smooth, jet-black leaf stems were particularly valued for keeping earring holes open and for increasing their size.

Adiantum pedatum L.

The hard, beautifully-polished stems of the five-fingered maidenhair attain a length of 1 or 2 feet in the redwood belt near the coast, and are there used for the black withes of some of their baskets, especially in those used for hats.

Gymnogramma triangularis Kaulfuss.

No Indian name was obtained for the gold-back fern which is common on open, brushy hillsides and in forests throughout the county. The abundant yellow powder on the underside of the leaf is largely composed of a curious crystalline compound which was isolated and named ceroptene[1] by Dr. Walter C. Blasdale, of the University of California. The leaf is said to have been formerly esteemed by the Spaniards at Ukiah a valuable medicine, the specific use of which I was, however, unable to determine. As in the case of the five-fingered fern, this plant grows much more thriftily nearer the coast. The stems are also used there to a slight extent in the making of baskets. Children are fond of making temporary gold-colored prints of the fern on their wearing apparel by rubbing the back of the frond against the cloth.

Polypodium californicum Kaulfuss.

Jou'-lish fal (Yuki).—The papery-leaved polypody fern, which consists generally of a single, simply pinnate leaf and grows from a few inches to a foot in height on mossy logs and banks in deep canyons.

The Wailakis rub the juice from the bruised root on sores for its healing effect and on the body for the cure of rheumatism. Other tribes use an extract of the root as a wash for sore eyes. A very amusing account was related to me by the chief of the Wailakis to show how the coyotes used one of these fronds as a counter—running to and fro and upward on the zigzag pinnae—in teaching the first elements of arithmetic to his progeny. This animal is most highly admired by all of the Indians for his alertness and cunning, and is imitated and almost deified for these special characters.

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[1] Erythea, vol. 1, pp. 252 to 258. 1893.

Pteridium aquilinum (L.) Kuhn.

Bis (Calpella).—The common bracken fern, which is a coarse native weed in this district. The hard root wood is easily split into flat bands, which are sometimes used by the coast Indians for the black strands of their cheaper baskets. They are much less frequently used for this purpose by the Indians of Round Valley and Ukiah, because, although susceptible of a fine polish, they are far weaker and more brittle than the saw-grass roots which compose the weft of their choicest baskets. The black color, which is claimed by some individuals to be natural, was not apparent in the sample of the fresh root collected by myself at Ukiah in July, 1898, but it was made black by chewing it for a short time, a process which, according to one authority, is really adopted by the Indians for the sole purpose of removing certain objectionable greenish fibers which lie parallel to the wood. One of my Pomo informants stated that the black color was developed by burying the root in mud for about a week. The root is said on good authority to be used by some of the Sierra Indians as a staple article of food, but I have no evidence that such is the case in Mendocino County, except that it might be inferred that the chewing process above referred to is intended as much for procuring nutriment as for the production of the black color. In this connection it might be stated that some of the native blacks of Australia are credited with having formerly made use of these roots for food, and that the variety known as *esculentum* is a source of starch in Japan.[1]

The large, somewhat coriaceous-leaved fronds serve as an excellent means of beating down grass fires, and also as a lining for berry baskets when this fruit is to be carried a long distance on horseback. According to Carl Purdy, the hay along the coast sometimes contains large quantities of this fern, and it is eaten by stock with apparent impunity, although it has been suspected in other places, especially in Europe, of being poisonous. The plant has been employed as a diuretic drug for horses, but its action is violent and dangerous.

The Little Lake name for the fern is *bē-bi';* the Concow *sū-lä-lä';* the Numlaki, *dos*, and the Yokia, *mä-ôr-dä-git'*.

EQUISETACEAE. Scouring Rush Family.

Equisetum variegatum Schleich.

Shân-tum' (Yuki).—The common scouring rush of the region. The highly silicious stems are used to some extent even at the present time as a substitute for sandpaper in finishing off arrows and other woodwork. Although grass was abundant, it was observed that horses would occasionally eat this weed. In their practice of medicine the Indian doctors take grim delight in throwing the hollow stems into the fire so that they may explode, and, by virtue of their continued crackling, stimulate their patients to renewed vigor. One Yuki woman informed me that the plant was a good medicine for sore eyes, but the report was not verified, nor was I informed in what way it was used. The Little Lake name is *shŭ'-mē*.

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[1] Maiden, J. H., Native Food Plants. Miscellaneous Publication 282, Department of Agriculture, New South Wales, pp. 63, 64. 1899.

TAXACEAE. Yew Family.

Taxus brevifolia Nutt.

Yōl'-kō (Concow).—The Pacific yew, or "yew" as it is most commonly called. The tree grows sparingly in the deepest cañons throughout the northernmost parts of this region, a few specimens having been seen along the stage road leading from Laytonville to Covelo. The wood is remarkably tough and elastic, and for this reason it used to be more highly valued than any other for making the strongest bows. The Indians about Ukiah informed me that they used to purchase yew wood from the Pitt River Indians of northeast California. Very few of these bows are now owned by the Indians.

The bright red, fleshy berry is edible, but the seed is considered poisonous.

Tumion californicum (Torr.) Greene.

Kä'-hē (Yokia).—The California nutmeg, a small tree which has much the same appearance as a young redwood, from which it may, however, be readily distinguished by its larger, sharp-pointed leaves; its olive-like fruit, and its white or straw-colored wood. The name nutmeg was applied to the tree on account of the resemblance which a cross-section of the kernel of the nut bears to a cross-section of the ordinary nutmeg. Since the flavor is also somewhat spicy, the nut might easily be mistaken for that of the nutmeg. The tree is common in deep canyons in the southern part of the county.

The yellow or reddish membrane which lies between the shell and the kernel, and passes into the white substance by deep convolutions, is bitter and very astringent; the kernel itself is rich and oily, tasting somewhat like cocoanut. When the whole nut is well roasted, however, it has a very agreeable aromatic taste somewhat like that of peanuts. These nuts are highly esteemed for food by the Indians, and they are sometimes gathered in considerable quantity. An assay made by the writer showed that over half of the kernel is composed of an oil[1] that could probably be used in cooking. An oil which is used for this purpose is obtained in Japan from the nuts of another species of the same genus.

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[1] For the physical and chemical constants of this oil see a paper by W. C. Blasdale, Journal of the American Chemical Society, vol. 17, pp. 935 to 941. 1895.

The wood, although nearly as soft as that of the sugar pine, is yet very strong and durable. Dr. J. W. Hudson, of Ukiah, showed me two logs, one oak, the other nutmeg, which had been cut down at about the same time. The conditions for preservation were decidedly in favor of the oak, but this was found to be so rotten that it could be easily kicked to pieces, while the nutmeg log was perfectly sound. The wood being strong, close-grained, and flexible, as well as spicy, is admirably adapted for toothpicks.

Several Pomo Indians informed me that some of the best of their baskets were made from strands obtained from the roots of this tree. The rigid, sharp-pointed leaves were formerly used as needles to prick pitch soot into the skin in tattooing. *Kō'-bē* (the k guttural) and *kē-bē'* are the names used by the Pomos to designate the tree.

PINACEAE. **Pine family.**

Juniperus californica Carr.

Spö kä-lä' (Yokia).—The sweet-fruited juniper, which grows on the hills near Ukiah. The dry fruit is sometimes boiled and eaten.

Libocedrus decurrens Torr.

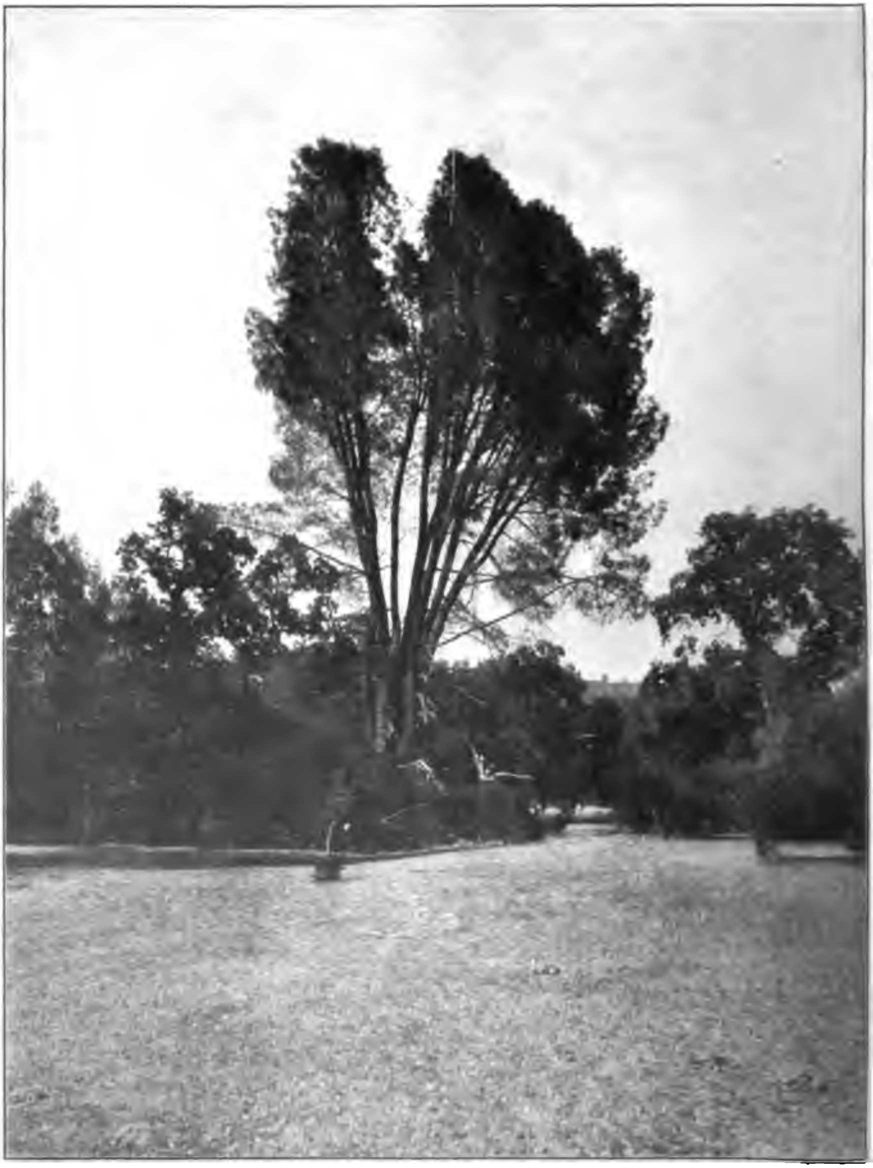
Shân-lē' (Yuki).—The incense cedar, or "cedar," as it is more commonly called in this region. The tree grows under much more favorable conditions farther northward, the few trees which grow in the mountains near Round Valley being considerably smaller than the average size.

All parts of the tree contain volatile oils, which give off a characteristic odor somewhat like that of incense. The odor from the thick, scale-like leaves is especially pleasing after the more volatile oil has been driven off by heat.

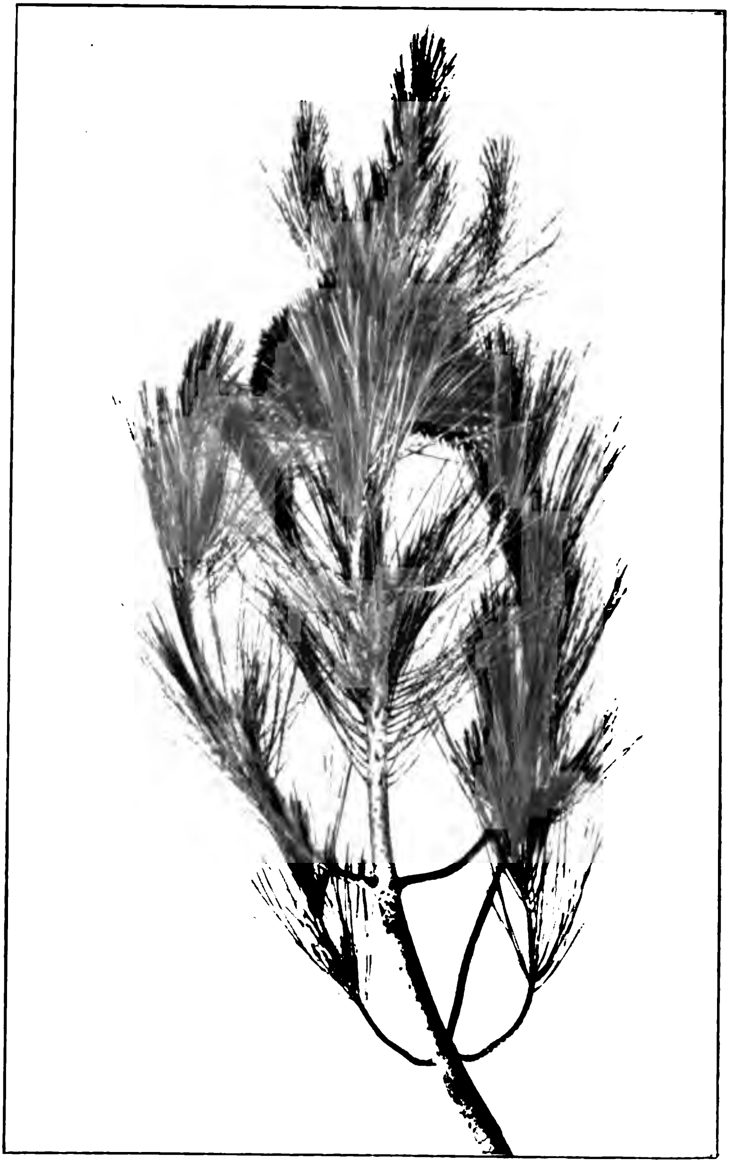
In the process of leaching acorn meal, the flat, intricately divided sprigs are in constant use by the northern tribes now located in Round Valley. As may be seen in the description of this process given on page 336, the object of the use is a double one. The dense leaflets serve to prevent the sand from becoming mixed with the meal, and at the same time impart some of their peculiar flavor to it. The oil contained in the wood makes the latter very resistant to decay when used as an underground timber. The smaller limbs are sometimes converted into bows, and a decoction of the leaves is occasionally used to relieve stomach troubles. *Hö'-tä* is the Concow name given for the tree; the Wailaki name is *gos*.

Pinus lambertiana Dougl.

Pä-hut' (the u guttural and prolonged) and *shūk'-ōl* (Yuki).—The sugar pine, which is sparingly represented in the most mountainous parts of the county. As these parts are remote from the Indian settle-



DIGGER PINE (PINUS SABINIANA).



DIGGER PINE CONES (PINUS SABINIANA).

ments, the tree is of little value to them. The northern tribes are especially familiar with the valuable cathartic properties of the sugar which is often found as an exudation on the partially burned base of the tree. *Shu-töt'* is the Wailaki name for this product; their name for the tree itself is *nä-tit'-nēs*. The immense long cones yield a large number of nuts which, when obtained in sufficient quantity, are as highly esteemed for food as are those from the Sabine pine described below.

Pinus ponderosa Laws.

Chä-öm' (Little Lake). -The yellow or bull pine which is found sparingly throughout the mountainous districts of the country, especially northward. The wood furnishes a small part of the timber which is used by the Government in the construction of the houses for the Round Valley Indians. It is used occasionally for lodge poles and for fuel. As in the case of the following species, the gummy exudation is used for chewing, and the pitch for its valuable medicinal and adhesive qualities. The nuts are too small to be of any food value.

Pinus sabiniana Dougl.

Pōl'-cum ōl (Yuki).—The well-known round-topped nut or digger pine (Pl. XI), one of the most common, and certainly one of the most characteristic, trees of the region. It grows singly or in small groups on open, dry and rocky hillsides in association with the manzanita or the common blue oak (*Quercus douglasii*), and may readily be distinguished miles away on distant hillsides by its thinly leaved and widespreading branches. In general aspect the tree is airy and extremely picturesque, the grayish-green color of the leaves being well in keeping with the general ashy-gray aspect of the surrounding scenery.

This tree is found throughout the Coast Range and in the foothill belt of the Sierra Nevada, and, since these are the regions which yield to the natives the greatest quantity of wild fruits and food of all kinds, the name "digger" pine, which was applied to the tree by the early settlers, is not altogether inappropriate. The cones (Pl. XII) might well be taken as an emblem of the Digger Indians of California. They are extraordinarily large and heavy, often measuring 8 inches in length by 6 or 7 in diameter and weighing from 2 to 3 or 4 pounds. The nuts are about three-quarters of an inch in length and are very sweet and oily. In order to determine their nutritive value an analysis of the kernels was made by Dr. Walter C. Blasdale, of the University of California, who found that they contained 51.05 per cent of a rich, fatty oil and 28.05 per cent of crude protein. When the State was first settled it was found that, after the summer's crop of native roots had been exhausted, these nuts formed a very important part of the regular Indian diet. At present the supply of flour and cultivated products renders it unnecessary for the Indians to go through the laborious process of collecting the cones and extracting the seeds, but they are often collected as a pastime both by natives and whites. The cones are obtained from the trees by cutting or beating them away from the branches, and the nuts are beaten out of the cones after the pitchy exudation has been removed and the scales opened by fire. The pine-nut season used to be celebrated by the Numlakis by holding a special dance. The fresh inner bark was formerly used for food when other rations were short during a prolonged winter.

The yellow pitchy exudation found in all parts of the tree is called *kă-wā'* by the Little Lakes and is used extensively both by the natives and whites as a protective and healing covering for burns and sores, and, mixed with corn meal, some white people use it in the form of a poultice as a counterirritant for internal troubles. It is also used to fasten feathers on arrows, and in former times the Yukis used to smear their bodies with it and then cover themselves with feathers in order to present a more formidable appearance in times of battle. All kinds of soot are used in tattooing, but that from burning pine pitch is especially esteemed. The design is pricked into the skin by means of a sharpened piece of bone or sometimes by the sharp awl-like leaves of the California nutmeg (*Tumion californicum*), and the soot is then rubbed in thoroughly.

The gum which often accompanies the pitch is called *jū* by the Wailakis. It is highly prized for chewing by all except the oldest Indians, who have no teeth. White children chew it for pleasure and older persons chew the more pitchy material as a cure for rheumatism, for which purpose I was assured that it was very efficient.

The wood is used very little for poles or timber or for firewood. It has, however, two interesting applications. A quarter cylinder taken from a log which has been well hollowed out by fire was used, before the days of store boxes, as a rude kind of a drum at dances. One end was securely buried in the wall of the temescal or sweat house, while the other projected freely in a horizontal direction. When a dance was in progress, it was some one's duty to thump upon this with both feet and thus assist in a general attempt to insure a proper cadence.

The more pliable wood from the root is the chief source of the material used in the construction of the large V-shaped baskets which are used by the Little Lake Indians and by other tribes for carrying acorns. The root is warmed in hot, damp ashes, and the strands are split off before cooling. They are brittle when dry, but, after being soaked in water, they are easily manipulated in the more simply woven baskets which are made by passing the strands in and out through the numerous vertical withes that make up the skeleton. They are not sufficiently pliable to be used like thread, as sedge roots are, in wrapping round and round a horizontal withe.

The Yokia name for the tree is *nä-kä'*. These people drink an infusion of the bark for consumption, and have a novel way of using the small twigs and leaves for the cure of rheumatism and for bodily bruises. A fire is built over some rocks and allowed to burn down. The pine twigs are then thrown upon the warm ashes and the patient, wrapped well in blankets, lies down upon them. Water is occasionally sprinkled on the rocks beneath, so that steam together with the volatile oil from the leaves is constantly given off. After inhaling this and sweating most profusely for eight or ten hours, the patient is said to be invariably able to move without pain.

The Wailaki name for the tree is *del'-shit*, and the Concow *tä-nē'*, the e being prolonged.

Pseudotsuga mucronata (Raf.) Sudworth.

Nū (Yuki).—The Douglas spruce or "fir," as it is almost universally called in this region. Lumbermen also know it as "Oregon pine." It is the commonest and, next to redwood, the most valuable lumber tree of the county. At Round Valley it constitutes the chief source of the timber made at the Government sawmill for the construction of the Indian huts and for the public buildings. Nearly all of the zigzag rail fences which extend away so picturesquely in every direction throughout the valley were made from timber split from these trees. The larger branches are used to a considerable extent for the manufacture of a superior quality of charcoal, and the smaller ones are, on account of their resinous character, sometimes used as torches in fishing. The smaller roots, about the size of a pencil, are, according to Dr. J. W. Hudson, nearly uniform in diameter for 8 or 10 feet, and are used in the manufacture of some very fine Indian baskets.

The leaves, called *nū fal* by the Yukis, have a very pleasant balsamic odor, and on this account they are highly esteemed by nearly all of the Indians, and many whites, as a substitute for coffee. They are generally used while still fresh and are consequently of especial service to camping parties. A refined half-breed woman assured me that the beverage was "right nice."

The leaves are used medicinally in the sweat bath cure for rheumatism, being considered by a Little Lake medicine woman as even superior to wormwood (Artemisia) for that purpose. The spring buds are used in the form of a strong decoction for some venereal diseases.

Kä-lä' shā and *nä-kä'* are two Yokia names given for the tree.

Sequoia sempervirens (Lamb.) Endl.

Gä-sūl' (Yokia).—The giant coast redwood. This tree grows in a continuous belt nearer the coast, but occurs sparingly in sheltered foggy valleys and canyons within a few miles of the town of Ukiah.

It supplies the lumber which the Indians use there for the construction of their houses. The Round Valley tribes make little or no use of the lumber, because it is so difficult to get it into the valley. The coast Indians used to convert the fallen logs into canoes by skillfully hollowing them out by means of fire, and these were often sold to other tribes.

TYPHACEAE. Cat Tail Family.

Typha latifolia L.

No Indian name was learned for this plant, which is the "flag tule" of this region. It is more generally and properly known as cat-tail or cat-tail flag. The roots and the bases of the stems are used considerably for food, and the down of the fruiting part is used to some extent for beds.

ALISMACEAE. Water Plantain Family.

Sagittaria latifolia Willd.

Kä'-bö (given by a Little Lake woman, who was specially well versed in plant lore).—A plant, probably this species, which was described as being somewhat similar to the water plantain (*Alisma plantago-aquatica*), a specimen of which was shown her. The name means "water potato," and is given to the plant on account of its fleshy and edible potato-like tubers. The species is common northward, but probably very rare in this district. No specimens were observed, and the Indians seem to have but little knowledge of it.

POACEAE. Grass Family.

The grasses are particularly well represented in the rich adobe land of Round Valley, and, especially in former times, constituted one of its chief sources of wealth, because the live stock fattened upon it could be driven to market. The large cost of transportation at the present time prevents the sale of the hay in the city markets, the nearest of which is the town of Ukiah, 70 miles distant.

Very little direct use is made of these grasses. They are not used for food by the Indians, as is clover, nor are any of them used to make baskets, the so-called "grass baskets" being made from the leaves of a kind of sedge (*Carex* sp.) known as "saw grass."

The first general appearance of grass in the springtime has never, as in the case of other food products of nature, such as clover and acorns, been especially celebrated by a dance or other performance. There is, however, a kind of game into which grass enters very conspicuously and which is therefore called the "grass game." It is a purely gambling sport, which is played by four persons, two of whom manipulate a pair of small cylindrical bones in their hands. These are skillfully concealed in bunches of very finely chopped grass and are dexterously changed about from hand to hand at the will of the manipulators or the command of their opponents, who are seated opposite to them. One of the bones in each pair is marked by a band of black thread, and it is the object of the opponents to guess in which hand this bone is concealed. Any number of persons may bet on the game, but not more than four do the playing. It has long been the favorite way of gambling, but recently the authorities at Round Valley have forbidden its continuance. It is still played by the Indians who are not under such direct governmental control.

The fresh leaves of any kind of grass were formerly used in tattooing, the green juice being pricked into the skin with a needle or with the sharp awl-like leaves of the California nutmeg. The finer grasses were also formerly used, together with dry oak leaves, for tinder in the process of making a fire by friction.

Avena fatua L.[1]

Sī-mē'-yä (Yokia, or perhaps the Spanish name, semilla).—"Wild oats," a grass which is common throughout the country, and which is supposed by some to be that from which our cultivated oats (*Avena sativa*) originally sprang. Many botanists claim that this is native only to the Mediterranean region of Europe, but the Pomos claim that they were acquainted with it and that they used the seed for food long before the Spaniards settled the country; and, in fact, one tribe of the Pomo stock—the Potter Valley Indians—used to be called *Bal-lō' kī* Pomos, "*Bal-lō' kī*" meaning Oat Valley. As pointed out in a letter from Mr. Davy, however, it is quite probable that this name really refers to the "California wild-oat grass" (*Danthonia californica*), a robust species which resembles the true wild oat, but is of a lower habit. Although now largely exterminated from Potter Valley and the surrounding country by stock, this grass was formerly very abundant there. The fact that the wild oat is, even at the present day, absent from localities in this same region, to which men and stock have not had ready access is a strong indication that it is not native to California. In fact, the general distribution of *Avena fatua* throughout California indicates that it is not indigenous.

The seed is hard and slender, and so sharp-pointed and hairy that its use for food is altogether uninviting and, to the uninitiated, apparently dangerous, but it is consumed by the Indians in large quantities.

The process of gathering wild oats and of converting them into flour is the same as that employed in obtaining flour or meal from the seeds of many other plants, and may therefore well be described here as typical.

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[1] For assistance in the identification of the grasses I am indebted to Mr. J. Burtt Davy, of the University of California, and to Mr. J. G. Smith, formerly of this Department.

The seeds are gathered (Pl. XIII, fig. 1) almost exclusively by an old squaw, who, providing herself with a V-shaped basket capable of holding over a bushel, goes out into the fields at the proper season, and, by means of a piece of basket work made into the form of a tennis racket, beats off the ripe seed into the basket and then carries it home. The hair and the sharp points are singed off and the seeds parched by skillfully tossing them about with live coals in a shallow basket. The parched seed is then ground in a mortar until the flour is as fine as desired. Common salt or the ash from certain plants is added and the flour is generally eaten in the dry condition. *Sī-mē'-yā hō* is the Yokia name applied to this flour. The seed has been shown to be easily improved by continued cultivation and careful selection.

The Spanish word "pinole" has come to be almost universally applied both by the Indians and whites to any meal made from parched seeds. *Sī-mē'-yä hō* is therefore a special kind of pinole. The same name has applied also to the seeds (Pl. XIII, fig. 2) from which the meal is made. In its original Spanish and later Mexican sense, however, the word was much restricted in application.

Only one kind of pinole seed is usually collected at one time, and each collection is generally kept separate until after the chaff has been removed and the seeds ground into meal. The different kinds may then be mixed to suit the most fastidious taste, some particular kinds being frequently added in small quantity to give a particular aromatic taste, which is often very appetizing. When the process for the removal of the chaff and the subsequent parching is the same for several kinds of seeds, they are mixed together before the process is begun. The method must necessarily vary considerably with the kind of seed used.

Bromus marginatus Nees.

Kä'-op (the o much prolonged) (Yuki).—A rough, hairy grass with a simple, slightly drooping panicle of rather heavy seeds, which grows commonly in separate tufts 2 to 3 feet high in the damp meadows of Round Valley, and is known to the whites as "poverty grass." The seeds were formerly used for pinole. The Little Lake name for the grass is *shä-tä'-ē*.

Elymus triticoides Buckl.

Sē'-hĭl (Yuki).—A tall, slim, very conspicuous gray-green grass, 3 to 6 feet high, which grows all over the meadows and in the hills about Round Valley and near Ukiah. The seed is abundant, and it is so well known to be used for pinole that the plant has been called "squaw grass" by the whites. It is more widely known as "wild wheat." The foliage makes an excellent fodder after most other grasses have been dried up in late summer.

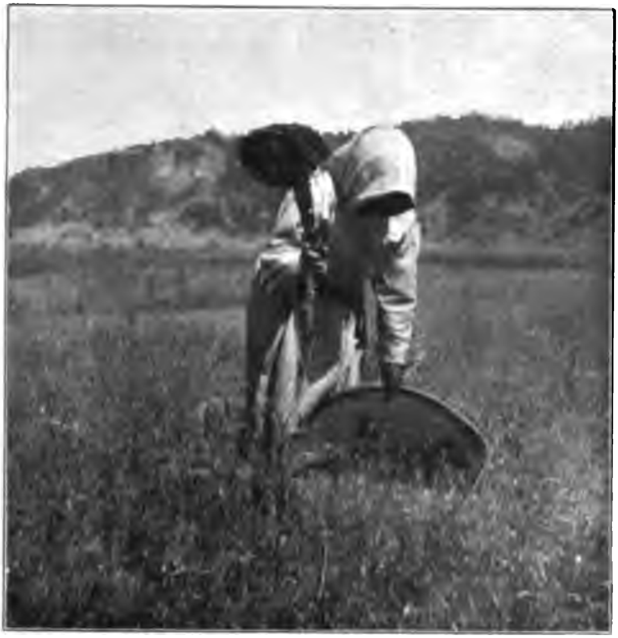

FIG. 1.—INDIAN SQUAW GATHERING PINOLE SEED.

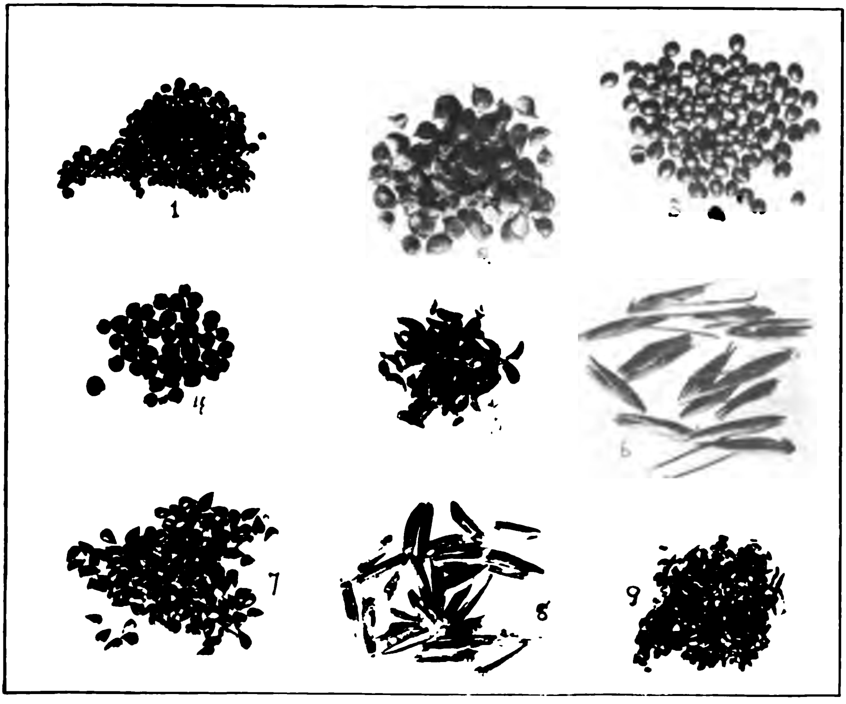

FIG. 2.—PINOLE SEED: 1, CALANDRINIA ELEGANS; 2, RANUNCULUS EISENII; 3, CEANOTHUS INTEGERRIMA; 4, TRIFOLIUM VIRESCENS; 5, MADIA DISSITIFLORA; 6, AVENA FATUA; 7, HEMIZONIA LUZULAEFOLIA; 8, WYETHIA LONGICAULIS; 9, BOISDUVALIA DENSIFLORA. ALL NATURAL SIZE.

Hordeum gussoneanum Parl.

This is a graceful weak-stemmed grass, 4 to 8 inches high, which, much to the detriment of cultivation, often completely covers large areas of low adobe ground in Round Valley. It bears a close resemblance to depauperate forms of the foxtail grass (*Hordeum murinum*). Its seeds are supposed to have been carried into the valley by sheep. While still green the grass makes an excellent fodder, but later it often causes much mischief on account of its barbed florets, which easily separate from the spike and get into the mouth, nose, ears, or eyes of animals, where they inflame or perforate the tissues, and sometimes cause such severe suffering that the animal has to be killed. Several cases were reported where different animals lost their eyesight from this cause. One of the best methods proposed for getting rid of the grass is to burn the fields over in July or August, when the seed is fully mature and the fields are dry.

Sitanion elymoides Raf.

Koi-ē'-kas''-il (Yuki).—A native grass, 1 to 2 feet high, which, on account of its long capillary awns and wide-spreading spike and the consequent resemblance to the tail of a tree squirrel, is popularly known as "squirreltail." It is common along creeks and on dry hills throughout Round Valley. As in the case of the preceding and next species, the grass is excellent for green pasturage; but when dry it is even more dangerous to stock on account of the greater ease with which the sharp barbed florets separate from the spike.

Hordeum murinum L.

Koi-ē'-kas''-il.—The same name is applied by the Yukis to this grass as to the preceding species. It is, however, recognized as something quite different, and is well known as foxtail. This differs from the squirreltail in its coarser structure and less spreading spike. The awns are somewhat less dangerous to animals. The seeds have been, and perhaps are still, used to some extent by the Indians for pinole.

Hordeum vulgare L.

No Indian name was learned for the ordinary cultivated barley. The poorer squaws often go along the edges of a barley hay field after the hay has been cut and gather considerable quantities of the ripened grain.

A decoction of the well-parched seeds is drunk by some of the Yukis as a substitute for coffee, but most of the seed is ground into flour and made into bread. In the process of grinding a very ingenious method is used for separating the flour from the coarser unground particles of the seed. This is carried out by tossing the mixed mass about with a swift rotary motion in a shallow, obtusely conical basket until the centrifugal force has carried the heavier particles to the top of the basket, whence they are dexterously removed and afterwards reground.

Lolium temulentum L.

Mât (Yuki).—An annual grass universally known as darnel or poison rye grass, which is rather commonly introduced in Round Valley. It has a stout culm which bears at the summit a series of short, sessile, heavily seeded spikelets, which are closely appressed alternately on opposite sides of a slightly zigzag rachis. The grass is much like the commoner perennial rye grass (*Lolium perenne*), but is easily distinguishable by its stouter culm, more erect habit, and larger seeds. Whether from the presence of some specific poison or of some poisonous or poison-producing fungus which grows on or within the grain, the seeds of this species have generally been considered unfit and even dangerous to use in any way for food. I was, however, assured both by one Little Lake Indian and also by the chief of the Yukis that the seed was formerly used for pinole. Both were ignorant of the fact that the seeds were considered poisonous and no special process was used in preparing the pinole. It seems probable that the grain is not poisonous in this locality, but it is possible that the poison is destroyed in the process of parching.

CYPERACEAE. Sedge Family.

Carex spp.

The long, tough rootstocks of several and perhaps most of the local species of sedge or saw grass are used by the Indians of the county for making baskets, and were occasionally used long ago for making ropes. A great amount of patience is exercised in tracing the rootstocks out for a distance of from 2 to 5 feet through the sand and mud and in preparing the strands for use, but the labor is considered well worth while, for a well-moistened strand the size of an ordinary toothpick is nearly as flexible as string and can scarcely be broken by hand. The baskets (Pl. XIV) manufactured from them are known technically as "root baskets" and are the strongest, most durable, and most costly that are made. Sedge rootstocks are the most important of underground material used for such purposes.

Carex vicaria Bailey.[1]

Tē (Yuki).—A coarse, leafy sedge, 1 to 2 feet high, which frequently covers whole acres of marshy land in Round Valley and is commonly known as "saw grass." The leaves shoot up directly from the root and form tufts, in the center of which there are several solid three-edged stems, each of which bears at its summit a small spike of inconspicuous flowers or fruit.

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[1] For the identification of the sedges I am indebted to Prof. C. F. Wheeler, of Agricultural College, Michigan.

When young the foliage is soft and makes excellent pasturage and is sometimes cut for hay, but when old the edges and keel of the leaves become so sharp and harsh that they are apt to cause painful laceration in the mouth. The plant can not then be used for forage. This harsh character of the leaves militates against their use in the making of the so-called "grass baskets," for which purpose those of the two following species are preferred.

Carex sp.

Tâ''-tet'-el (Wailaki).—A sedge or saw grass which is similar to the last species, but which grows in large tufts only, its favorite habitat being along streams or near springs in the mountains. The leaves are more slender and more pliable and the edges and keel are not so sharp and saw-like. As shown above, the roots are used for baskets. The leaves are valued for the same purpose, being specially used by the Wailakis in weaving hats and cheap semiflexible baskets. The hats are now exceedingly rare in Round Valley, but the flexible baskets are common.

Carex barbarae Dewey.

Kä-hōm' (water gift) (Pomo).—A sedge which grows near Ukiah in rich alluvial soil along streams, into which the white roots often extend in a picturesque way. It differs from *tē* in being taller and in having several cylindrical fertile spikelets at the end of each fruiting stem instead of one unsymmetrical spike. A specimen cultivated as a curiosity by Mrs M. E. P. McCowen, of Ukiah, had leaves some of which measured 11 feet in length, but this length is exceptional. The rootstocks are very often employed in basket making, being used for the white or creamy groundwork of most Pomo baskets. Its value is only about one-fourth that of the following species.

The process of collecting and preparing *kä-hōm'* has been admirably described by Dr. J. W. Hudson.[1] Men as well as women resort to a favorite locality, and, provided with a clam shell and a stick, begin with hands and feet to dig out the selected rootstocks. An end is grasped between the first and second toes, and while the clam shell serves to scrape away the soil, the stick is used to pry away the stones and other roots and to loosen the ground. A woman will secure from 15 to 20 strands in a day, while a man, on account of the time wasted in his long siesta, averages only about 10. To maintain their flexibility and to soften the scaly bark, the rootstocks are placed in shallow water immediately after they have been dug and are left there until morning, when the bark is removed by the women. One end is chewed until the bark is free and well separated from the wood, and then, being still held in the mouth, while the other end is grasped and held taut by the first and second toes, the bark is carefully scraped away, leaving a remarkably tough white or tan-colored strand about one-half the original thickness. These are arranged in small coils and carried by the women to camp.

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[1] Pomo basket makers. Overland Monthly, vol. 21, pp. 561 to 578. 1893.

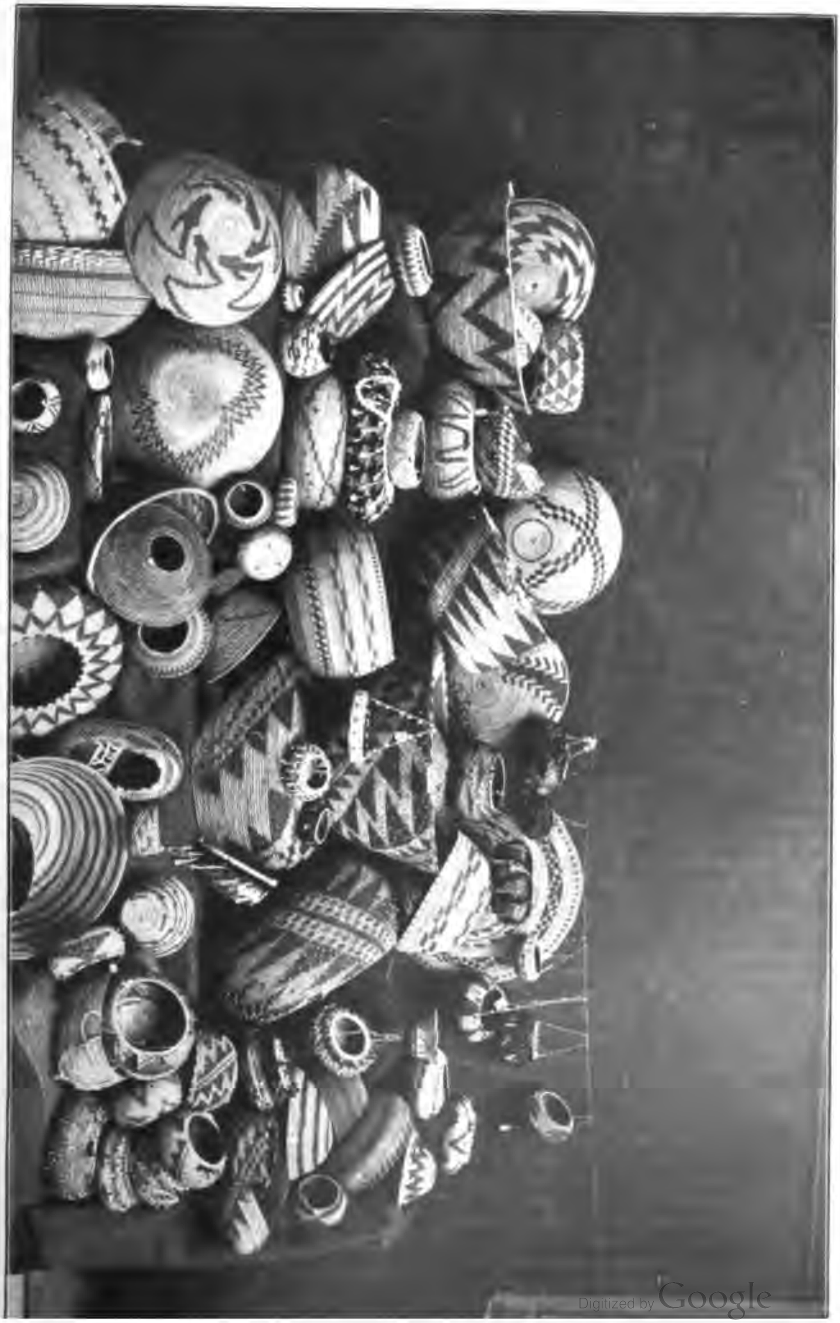
Scirpus sp.

Tsū-ish' (Pomo).—An unidentified species of bulrush which I have seen only under cultivation, living specimens having been procured by Mr. Carl Purdy at Clear Lake and sent to the Department. The plant died without flowering, but had sent up a long, leafy stem, and showed a strong tendency to develop new plants from its running rootstocks. The leaves are alternate, channeled, and quite grass-like, except that they are rigid and the older ones have sharp, knife-like edges. As the plant is considered four times more valuable for its rootstock fiber than any other species of sedge, and as there has been considerable doubt as to the character of the fiber, the roots were carefully examined before planting. At the base of the main stalk there was an almost ligneous tuber, proceeding from which there were small fibrous roots and several rootstocks, about one-fourth of an inch in diameter, which consisted of three very distinct tissues. The outer part or skin was brown and like parchment. The middle one consisted of a yellowish brown, friable coating, while the heart had an exceedingly tough, woody structure. The outer surface of this woody tissue, which, judging from an inspection of the baskets in the Hudson collection, makes up the great bulk of the black fiber of the finest Pomo baskets, has a faintly ribbed structure, and varies from light brown to nearly jet black. The interior portion is more or less white. There has been some question whether the strands from these rootstocks are artificially blackened or not, but it is certain that some of them are used just as they are, while others are blackened with the juice of poison oak, or by burying them with charcoal, ashes, and earth for about eighty hours. Whether the more brownish strands only are so treated, or whether all are occasionally subjected to the same process for the purpose of obtaining a darker shade than can be found in nature, I have been unable to determine.

The plant is very rare, if found at all, near Ukiah, the chief supply being purchased at 1 cent a root from plants collected by Indians at Clear Lake and in certain parts of Sonoma County or along the seacoast.

SEDGE-ROOT BASKETS.

In practice the process of making these root baskets (Pl. XIV) is a very tedious one, one which requires such an infinite amount of patience as an Indian squaw alone is able to command. The rootstocks, so care-



POMO INDIAN BASKETS, MADE CHIEFLY OF SEDGE ROOTS.

fully collected during the summer and early fall, must first be split into fine strands for direct use. As carried on at Round Valley under my observation, the process is as follows: The rootstocks, denuded of their two outer coverings, are thoroughly soaked in warm water, and one end of a root is divided to the center by means of the finger nails into three parts. One of these parts is held firmly between the teeth while, by means of the fingers, the whole root is carefully and very evenly split into three sections. Each of these sections is again separated into three parts in the same manner, and the same process is carried out until the strands are as fine as may be desired, the value of the basket depending in great measure upon the fineness of the strands, as well as upon the general beauty of the finished fabric. These strands are used, not like those from the pine root, to wind in and out between vertical withes, which constitute the vertical skeleton of the cheaper baskets, but more like thread to wrap around horizontal withes. In beginning the basket three very pliant withes are so selected that when placed together their combined cross sections will be nearly circular. The use of three "sticks" instead of one, as is sometimes the case in less costly baskets, gives much more elasticity and greater strength to the basket. The strand is wrapped tightly about one end of the compound withe, and as the wrapping progresses the wand is bent into a minute circle. The central hole is filled in by stitching over and over again, and with this as a basis the little plaque is built up by the addition of other coils into the admirably water-tight baskets, which are used by the maker for ornamental and useful purposes, and which, on account of their beauty and durability, are often handed down as heirlooms to her children. Some are used as cooking vessels in a way which is described later on pages 312, 337.

The general shape and plan of the basket must necessarily be carried in the mind, for there is no skeleton to serve as a guide. Infinite care must therefore be exercised, not only in preserving the symmetry of shape, but also the symmetry of the designs, which are worked in with the black and white strands. It requires many months, sometimes years, of leisure work to complete a first-class basket. But when they are complete they are frequently genuine works of art, and are highly prized by collectors of curios, who pay from $2 to $5 or $10 and even as much as $125 for a single basket. Some of the very best are most exquisitely decorated with brightly-colored feathers, the bases of which are woven in with the strands. All are more or less individual in their shape and pattern. The accompanying illustration (Pl. XIV) was reproduced from a photograph of a part of the Hudson collection of baskets, which is now the property of the United States National Museum. It well illustrates some of the prominent styles and patterns.

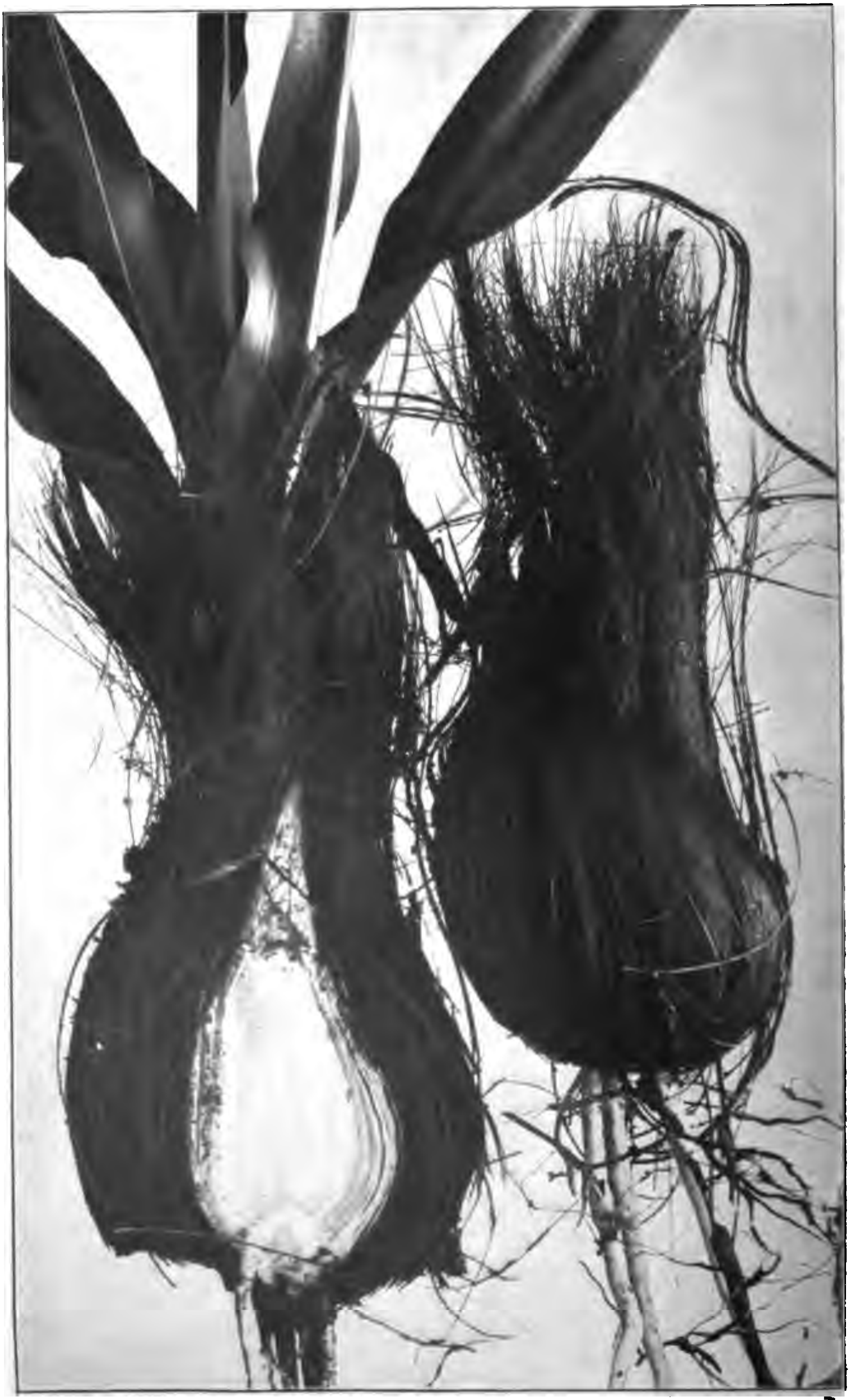
JUNCACEAE. Rush Family.

Juncus effusus L.

Lol'-um (Yuki).—The common rush of the region—a leafless plant with numerous wiry flower stalks which shoot up directly from the ground and form clumps 2 to 4 feet high. The small inconspicuous flowers are borne in loose paniculate clusters several inches from the awl-like tip. The plant is common in marshy land throughout the district and is most commonly known as "wire grass" or "spring grass." Cows and horses will eat it in early spring while it is still crisp and tender. When older the wiry stalks are used in various ways for tying and for making temporary baskets. It is with these stems that the Indian children are first initiated into the art of basket making. The basket ware rackets used in gathering pinole seeds are occasionally made from them also. In the Hudson collection of baskets, now at the United States National Museum, there is a cheap and very interesting device for catching fish which is made altogether of this rush. It is a slightly conical, net-like, somewhat rigid structure about 18 inches long by 4 inches in diameter. The open end is provided with a longitudinal slit on one side which allows the opening to be readily dilated at the will of the operator. It is very doubtful if this arrangement is ever used nowadays, but the Pomo Indians who formerly used them were very crafty fishermen. By means of this trap they were, without the aid of either spear or hook and line, able to catch salmon and trout when they were found isolated in deep pools. One or more of the men would get into the pool: the open end of the basket was grasped in the left hand so that the opening lay between the hand and the body, the closed end pointing backward, and the chase was begun. The fish were frightened hither and thither, until one was caught between the vertical bank and the left side of the body when it was frightened into the trap. By holding the opening tightly against the body the capture was completely insured.

It seems probable that this method of catching fish was indulged in more as a sport than as a serious business, for all of the Indians have long been familiar with the use of the spear, and the most unwaltonian method of scooping them in by the bushel after having stirred up a lot of some poisonous plant in the water.

Wire grass is also used in the manufacture of wampum. The small perforated clam shell discs are closely strung on one of the wiry stems, and the cylinder thus formed is rolled between flat stones until all the discs are perfectly circular, when they are all finally polished by rubbing them with leaves and stems of the scouring rush (Equisetum). It is claimed that the stems are made stronger by first placing them in hot water and then drying. *Chä-bä'* is the name for the plant which is used by the Potter Valley, Little Lake, and Yokia Indians; *sī'-tō* is the Wailaki name.



SOAPROOT (CHLOROGALUM POMERIDIANUM).

MELANTHACEAE. Bunch-Flower Family.

Chlorogalum pomeridianum (Ker-Gawl.) Kunth.

Nösh (Yuki).—The plant commonly known as "soaproot" or "amole" (Pl. XV), which grows plentifully on rocky banks and hills throughout the district. It has a radical tuft of flaccid strap-like leaves, and a nearly leafless, paniculately branching stem 2 to 6 feet high proceeding from a bottle-shaped fleshy bulb which is densely covered with coarse brown hair. The flowers, which open only after midday, are white. The bulb is from 3 to 5 inches in length and 1 to 3 in width, and is the most interesting and useful part of the plant, some 8 or 10 different methods of using it having been cited to me by various individuals. For the sake of convenience these uses may be divided into two classes, one dependent principally if not wholly upon mechanical properties, the other upon the chemical properties of the poisonous substance sapotoxin, which the root contains in considerable quantity.

The coarse, horsehair-like outer portion of the bulb is sometimes gathered into bunches and made into small brushes, which are used especially in connection with the process of grinding acorns for meal. It used to be gathered in very large quantities and sold to dealers to be used as a substitute for hair in mattresses. As these proved unsatisfactory to the white people who used them, the demand soon ceased, and now the fiber is used for beds only occasionally by the Indians. About 50 pounds of this material was observed at an Indian hut near Ukiah.

The fresh green leaves are, on account of their flexible and half-succulent character, especially esteemed in summer, when most other leaves are dry, in the process of baking acorn bread. The dough is completely covered with them before being placed on the hot rocks and covered with other leaves and ashes. The parallel markings of the veins are as distinctly shown on the bread as they are on some pieces of fossil-bearing coal, which, when old, the bread very closely resembles. The green leaves used to be pricked into the skin to form green tattoo marks.

When the substance of the bulb is roasted a viscid juice is exuded. This formerly served as a substitute for glue in attaching feathers to arrows. When diluted with water it was smeared over the back of a bow, to which soot was then quickly applied in order to produce a permanent black color, which caused the bow to appear old.

Intermediate between the mechanical and chemical properties, the use of the plant for food and for soap should be mentioned. I have no clear evidence that the bulb itself is eaten, but the young shoots gathered in March are consumed by nearly all the Indians. Some of those who were most highly civilized pronounced these shoots to be as sweet as sugar when they are thoroughly roasted. It seems probable that this part does not contain much sapotoxin or saponin at this season.

The last-named substance is the principle which gives to the bulb its value as a detergent, or soap. This use was quickly learned by the early Spanish settlers, who called the plant *amole*. When crushed and rubbed into any fabric with water it froths up like ordinary soap. Long before the advent of the white man this was most extensively used for soap by the Indians, and even now many old squaws use it in preference to the ordinary article. Others prefer it especially in cleansing baskets and in washing their hair; and, indeed, on account of the absence of any alkali it is really preferable for washing silk and any delicate fabrics. It is used considerably for the special purpose of removing dandruff from the scalp. The hair is left very soft and glossy.

Besides this use as a hair wash, the roasted bulb is used antiseptically as a poultice for sores. The Wailakis rub the fresh bulb on the body for cramps and for rheumatism. This same tribe, and perhaps others, use a decoction of the bulb as a diuretic and laxative, and also for stomach ache characterized by an accumulation of gas in that organ. One Pomo Indian informed me that a white man advised him to use the soapy juice as a lotion for the cure of poisoning by poison oak (Rhus).

Second in importance to the use of the bulb as a substitute for soap is its use as a means of stupefying fish and thus procuring them for food. Large quantities were caught in this way in early days, but now this practice is forbidden by law. The method as carried out on the Russian River near Ukiah and described to the writer by a Pomo chief, is substantially as follows:

After the last June freshet, when the river was running very low, all of the inhabitants of a village or of several neighboring rancherias would assemble together at some convenient place on the river. The squaws were each provided with a quantity of the fleshy bulbs, which they deposited in a common heap and proceeded to mash up on the rocks. A weir 6 to 7 feet high had in the meantime been constructed by the men by driving willow sticks into the river bed and then lashing them together by means of redbud bark. Bushel after bushel of the crushed pulp was thrown into the water and thoroughly stirred in. Much of the finer material passed through the weir; the larger pieces were again taken out and again crushed and thrown into the water. The Indians, stationed all along the stream for 3 miles or so, added fresh bulbs here and there and kept the water in a state of thorough agitation. After a very short time all of the fish, and also the eels, but not the frogs, were so stupefied by the poison that they floated to the surface and were quickly captured, either by hand or by the use of a shallow, coarse-meshed basket.

Certain portions of several other plants are sometimes used either alone or together with soap root to produce the same effect, but none except the turkey mullein (*Croton setigerus*) (Pl. XIX), is esteemed as equally effective. After the fish have all been gathered together each Indian, rich and poor alike, is given an equal quantity. As much as 100 bushels was captured at one time and thus divided. Such wholesale poisoning was not indulged in very frequently; the general practice was and is in remote districts still carried on to a limited extent by a few individuals, who select small streams or deep pools for their operations. No ill effect has ever been noted as a consequence of eating fish caught by any of these "fish poisons," the reason being perhaps that the quantity required to kill a few fish is very small compared to the greater size of a man and that much of the toxicity is lost in the cooking, although no special method is employed in preparing it.

The Wailaki name for the plant is *gos'-chū*, the Numlaki, *shlā*, and the Pomo *ăm*.

Zygadenus venenosus Wats.

Mās (Yuki).—On account of its poisonous qualities and its resemblance to the true camas (Quamasia) a most highly esteemed food plant, this is known throughout the West as "poison camas" or "death camas." It is common in Round Valley and grows along with the true camas in moist rich meadows and along the borders of creeks. It is a slender bulbous perennial, one-half to 2 feet high, with rather stiff, mostly radical, grass-like leaves and a short simple raceme of greenish white flowers. In late summer, when the camas bulbs are gathered for food, the poison camas may be distinguished from the other by its less rigid stem, and by its fruiting capsules which are smaller and consist of three nearly distinct valves; in camas the parts are consolidated into an ellipsoidal capsule. The bulbs are very nearly identical in size and shape. Late in the summer, when the stems are often broken off, it is especially difficult to distinguish the bulbs, and it is at this time that cases of poisoning do sometimes occur.

Among the Indians no plant is more commonly known to be poisonous than this one. In cases of human poisoning the root is the part responsible, but the leaves are known to be fatal to sheep. Three distinct cases of human poisoning were cited by as many different tribes. Two of these terminated fatally, the symtoms as described being burning and smarting in the mouth and esophagus, dumbness, nausea, profuse vomiting, foaming at the mouth, dizziness, and mania. Death is almost sure to follow if the patient does not vomit freely.

Notwithstanding its well-known poisonous effect when taken internally, it is rather generally used as an external cure for boils and rheumatism and to alleviate pain caused by strains and bruises, it being preferred in the latter case to the well-known brands of painkiller. The bulbs are generally cooked, mashed, and bound as a poultice to the affected parts for about twelve hours. If the pain has not then entirely abated a fresh application is made.

For the cure of rheumatism the fresh bulb is mashed and rubbed on the affected joints twice a day for a period of about a month, that length of time being necessary for a complete cure. The plant is known as *tsin* by several tribes of the Pomo stock; the Wailakis call it *kē'-gus*.

LILIACEAE. Lily Family.

Nowhere in the world is there a more characteristic abundance and variety of bulbous-rooted liliaceous plants than in California, a provision of nature by which the primitive inhabitants have long been benefited. The bulbs (Pl. XVI) of all of the species here noted, with the exception of the soap root, are edible. All are highly nutritious when cooked, and many, especially the species of Calochortus, have a very agreeable nut-like flavor when raw.

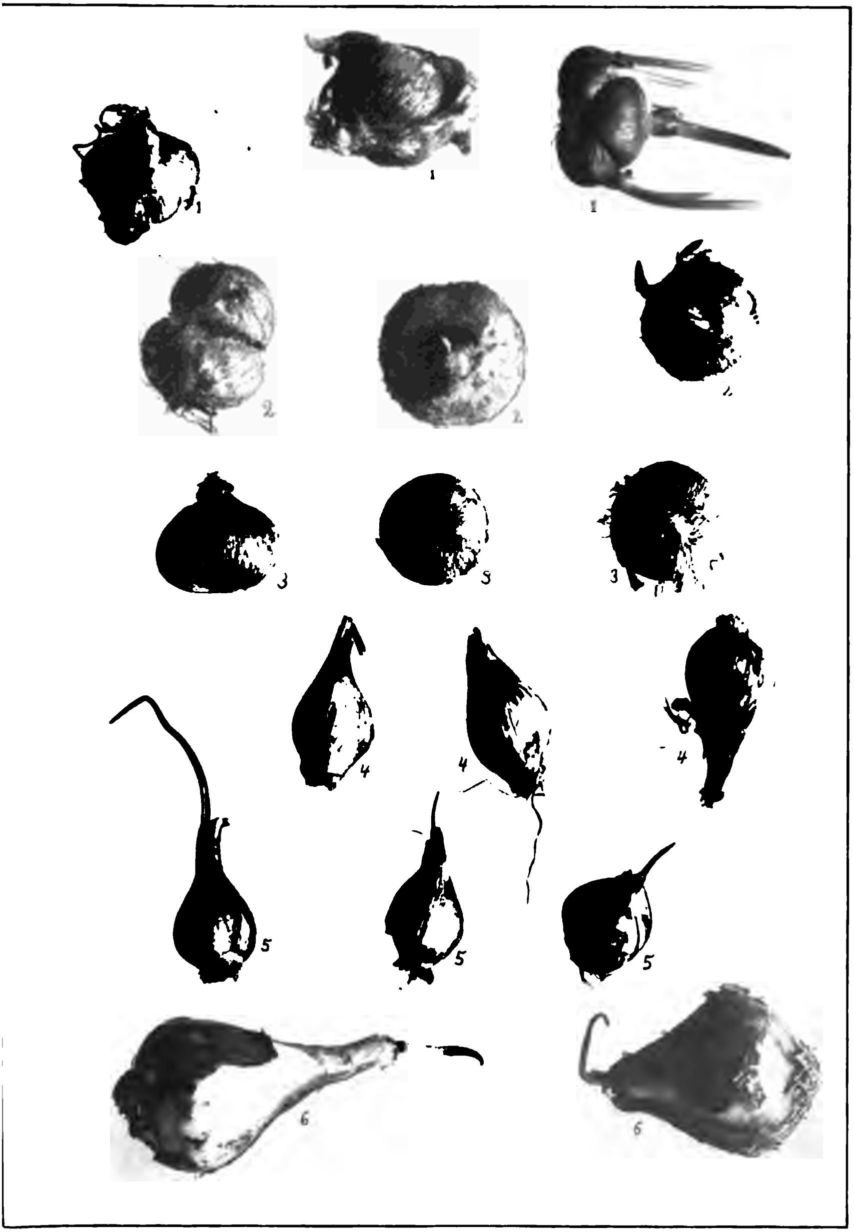
Clover is eaten in early spring, pinole in late summer, and acorns in winter. These bulbs assure them of a plentiful larder for late spring and early summer. It is on account of this extended use that the Indians have been called "Diggers." All of these plants have distinctive Indian names, to which in the case of some tribes the word "*bö*" is appended to denote the bulb. The same name is given to the ordinary potato, and is used to designate the corm, tuber, or bulb of any plant used for food, and even a few, such as the soap root, which are not so used. In speaking of these plants to me the Indians almost invariably called them "Indian potatoes." I speak of them collectively as bulbs, although they are mostly corms. Figures 3 to 5 represent some of the fleshy-rooted plants most commonly eaten.

Many are uncommonly handsome, and, indeed, a great many species are collected and cultivated as garden plants. Indians are employed to collect the bulbs at the proper season, but it is often only with great difficulty that they are restrained from eating some of the "nutty" kinds as fast as they are gathered. Some are eaten raw, as stated, but most of them are steamed in pits, as described below under "Quamasia."

Allium bolanderi Wats.

Shēp (Yuki).—The same Yuki and the same Pomo name is applied to this diminutive rose-flowered species and to the following. This grows in considerable abundance in loose rich soil along the banks of streams. Its spherical corms are only from ¼ to ⅛ of an inch in diameter, but they are very easily gathered and therefore used to some extent for food.

PLATE XVI.



Edible Liliaceous Bulbs: 1, Hookera coronaria; 2, Dichelostemma capitatum; 3, Triteleia laxa; 4, Calochortus pulchellus; 5, Calochortus venustus; 6, Quamasia leichtlinii. Three-fourths Natural Size.

Allium unifolium Kell.

Shĕp (Yuki).—The wild or Indian onion, which grows 1 to 2 feet high in rich, damp meadows throughout the region, and very closely resembles the young form of our ordinary cultivated onion, which is called by the same Indian name. The leaves are much more slender and the bulb never grows much longer than an inch. The bulb and the base of the leaves are fried and eaten to a greater or less extent by nearly all the tribes. One Indian considered them poisonous; another told me that quail eat the leaves in early spring and that their flesh then becomes worthless for food, because the odor of the onion pervades it. *Ko-bī'-yē* is the Pomo name applied both to this plant and the cultivated onion.

Calochortus maweanus Leichtl.

Tom'-tē bö (Pomo).—A delicate, tulip-like plant, whose purplish white flowers grow in the grass on open hillsides in early spring. The petals are hairy at the base, a character which has given the plant its name of "cat's ears." It is one of several species that have the same common name and are also called "star tulips." The corms are eaten in small quantity, mostly by children, and are described as "good sweet potatoes."

Calochortus pulchellus Dougl.

Bē-shū' bö (Yokia).—The exquisite lemon-yellow globe tulip (fig. 68), which is very common along roadsides and in loose earth in thin woods throughout the district, especially southward. The corms are small, being only occasionally as large as one's thumb, but they are easily gathered in considerable quantity. They are eaten raw or are roasted in the ashes for about an hour. The Yokia name means "deer potato," and is applied to the plant because deer are said to feed upon the corms. *Kä-lā' bö*, the Pomo name, means "tree" or "forest potato." The peculiarly fringed and closely overlapping petals, together with a peculiar saccate depression on each, and the arrangement of the inner hairs suggest an interesting adaptation for insect fertilization.

Calochortus venustus Benth.

Bā-töm' (Yokia).—The commonest species of the Mariposa or butterfly lilies (fig. 69), which grow, often in great tracts, on open hillsides throughout the region. The large, showy flowers are white or lilac-colored, and are marked, as indicated in the figure, with varying shades of brown, red, or yellow. The corms are very sweet and make good "potatoes."

Dichelostemma capitatum (Benth.) Wood.

Bö lä (Yokia).—A very common plant with a small fibrous-coated bulb from which spring 2 or 3 grass-like leaves and a long, slightly tortuous scape which bears at the summit a small head of violet-colored,

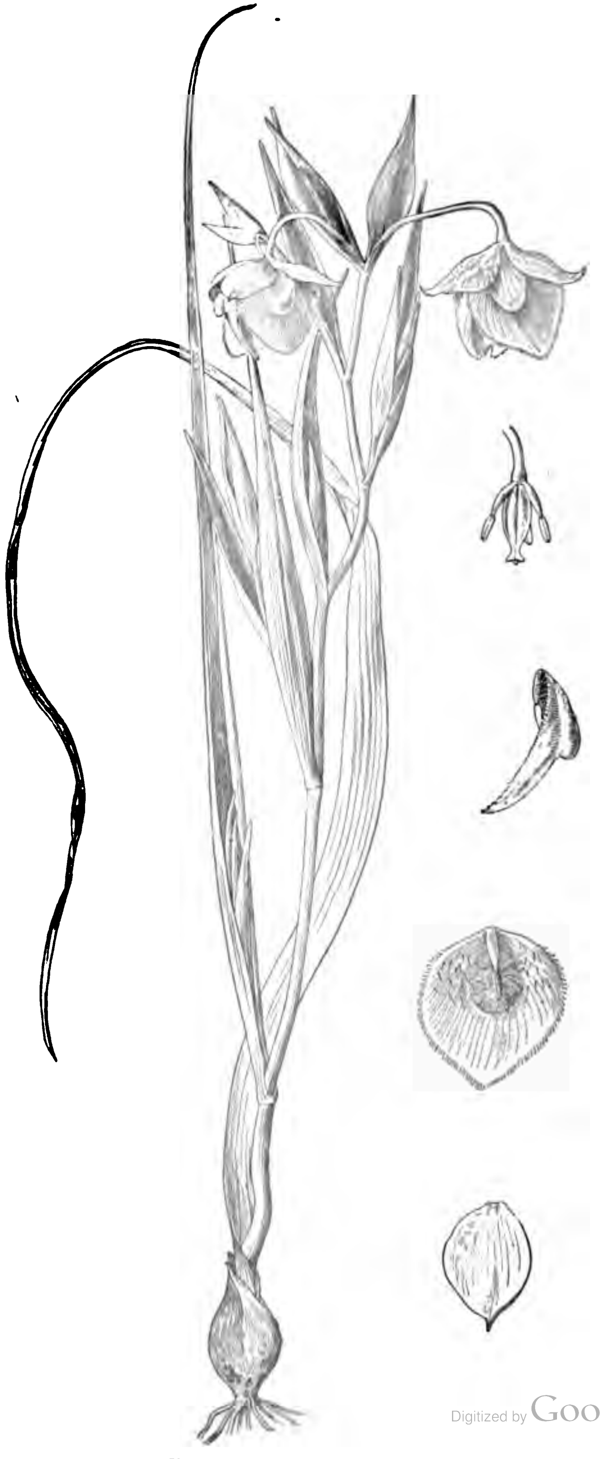
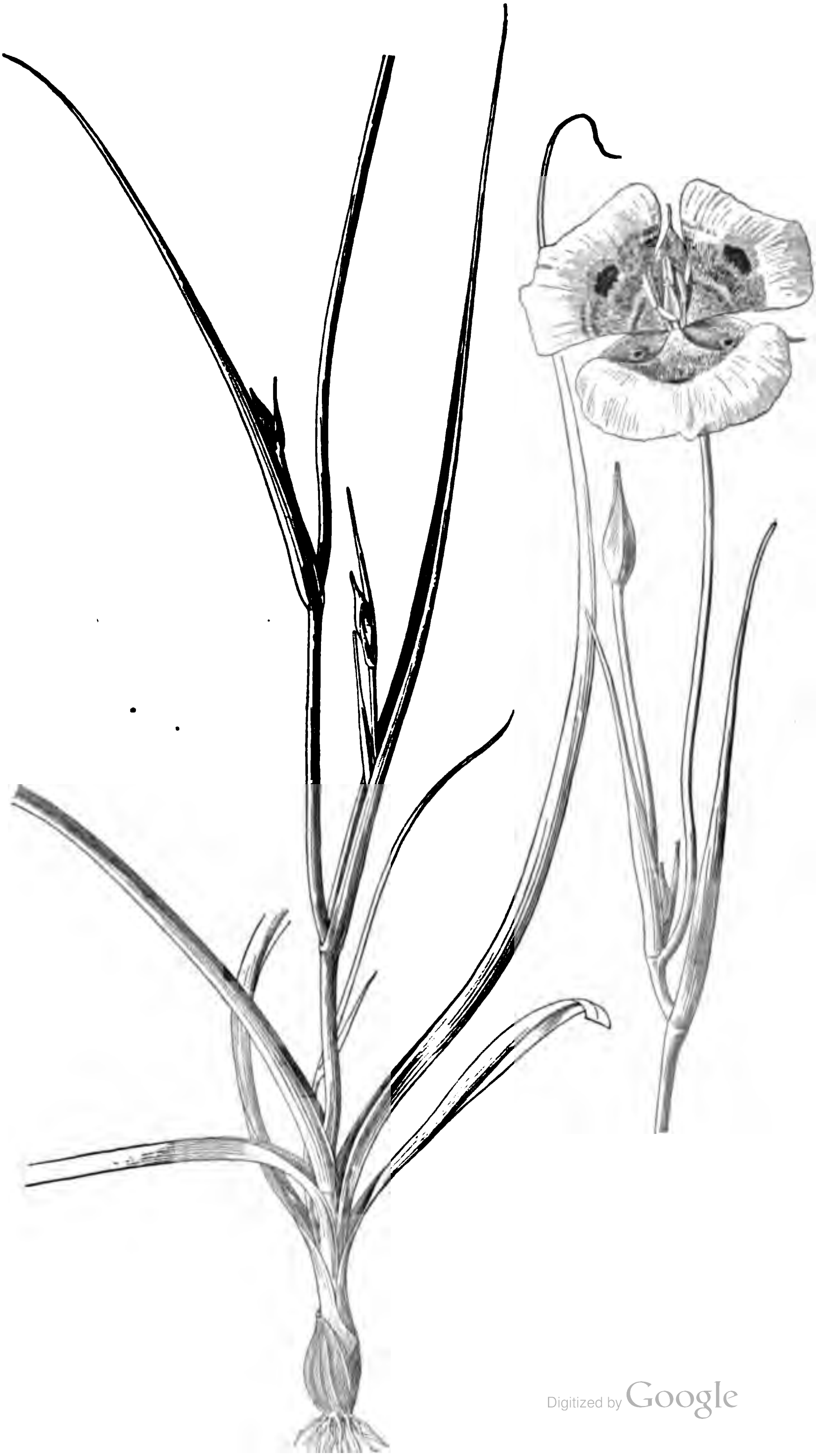


FIG. 68.—*Calochortus pulchellus.*



hyacinth-like flowers. It is an exceedingly common plant on rocky hillsides throughout the county and is often found as a weed in gardens. The bulbs are eaten raw, but are sweeter when cooked in ashes.

Erythronium giganteum Lindl.

No Indian name was obtained for this magnificent yellow "fawn lily," or dogtooth violet. It has a narrow corm 1 to 2 inches long, and is rather abundant in moist places in woods throughout the country. It is eaten, but not in large quantity. The Wailakis use the crushed corm as a poultice for boils and have a peculiar superstition that if they wash themselves with a decoction of it they can stop a rattlesnake from having dreams, which, they say, make them more irritable and dangerous.

Fritillaria mutica Lindl.

Bö tē (Little Lake).--The beautiful brown and green spotted lily which grows commonly in damp woods throughout the region. It has a depressed bulb with rice-like bulblets on top, a stout, succulent stem with whorled leaves, and a beautiful raceme of large brown and green spotted bell-shaped flowers. Although classed with the potatoes, the bulb is apparently not used for food. The Wailakis call the plant *jä-jin'-jū* and have a superstition that if the roots are dug up the acorns will drop off the oaks.

Hesperoscordum lacteum (Lindl.) Greene.

Hō bö (Yokia).--The white brodiaea which has radical grass-like leaves, and capitate clusters of white hyacinth-like flowers. It grows abundantly in rich valley land throughout the country. The bulbs are eaten either raw or cooked.

Hookera coronaria Salisb.

Da-cal' bö (Little Lake). -An apparently leafless plant, about a foot high, which has a single flower stock with a terminal umbel of blue funnel-shaped flowers and is commonly known as the "harvest brodiaea." The radical leaves usually dry up before the flowers appear in May or June. It is exceedingly common in grain fields and on dry, grassy hillsides throughout the region. The brown-coated corm is about ¾ of an inch in diameter and is greatly relished by sheep as well as by the Indians. It is sweet after roasting for a day. The Yuki name is *ānt-pot'*.

Quamasia leichtlinii (Baker) Coville.

Hoi-önt' (Yuki).--A species of camas, 2 to 4 feet tall, which grows in very great abundance in the rich, damp meadows of Round Valley and northward, but which is practically unknown to the Indians about Ukiah. The plant has an onion-like bulb about an inch in diameter, which bears 3 or 4 long grass-like leaves and a single robust but succulent and leafless stem, which in June is graced by a long raceme of large blue flowers which are open only at night. This is the largest and by all odds the best of all the Indian potatoes, and on account of its abundance at Round Valley it is there consumed in much greater quantity than all of the other species combined. The plant is inconspicuous in the daytime, but at night whole meadows may be seen to be covered with it. The name camas is very seldom used by either the Indians or whites. *Ket'-en* is the Wailaki name which was given to me for the plant by Mr. Frank Youree, of Covelo, who stated that the name *Ket'-en chow* given to an adjoining valley was applied to it on account of the great abundance of these plants which were found there. This valley is especially noted as a fine hog country. These animals fatten better on the bulbs than they do on corn.

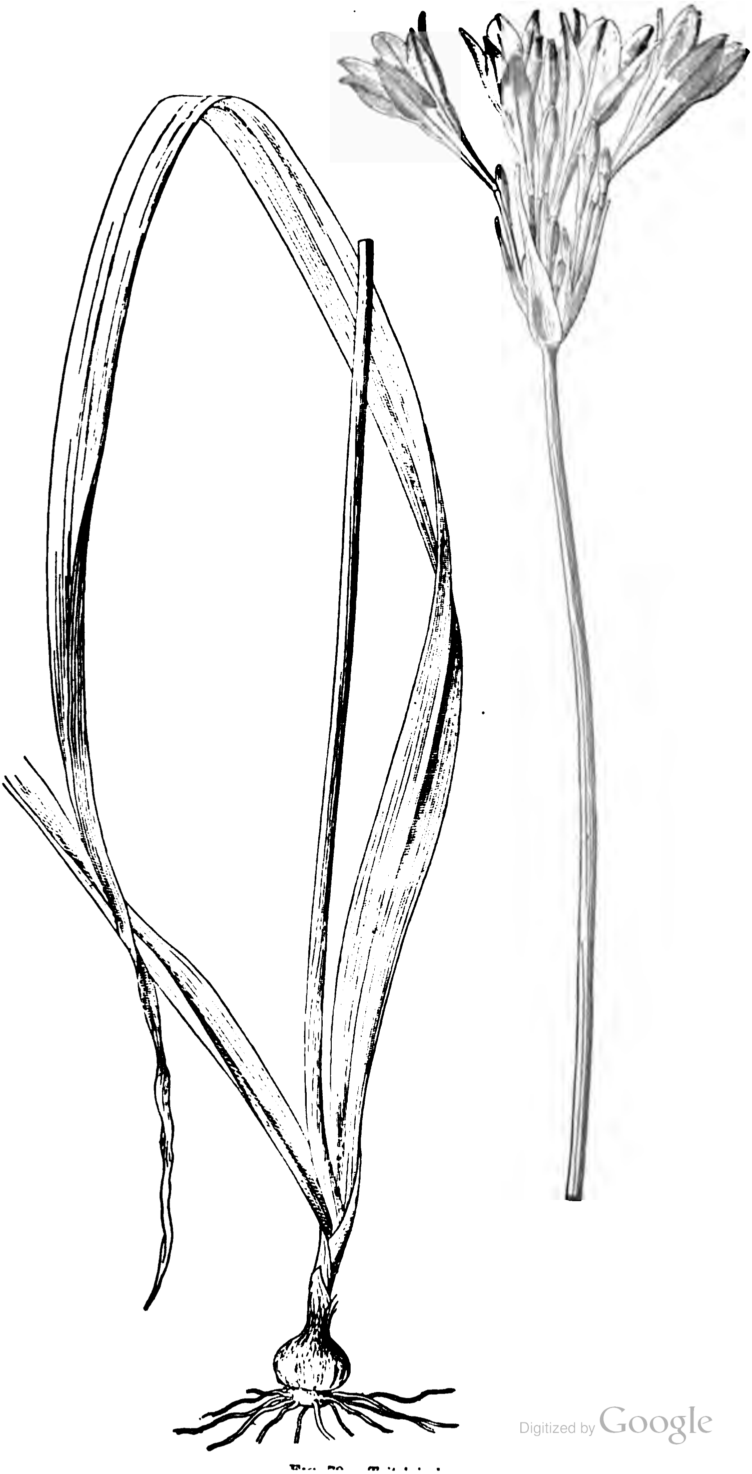
The bulbs are not eaten so much at present as they were in former years, but during the specially dry summer of 1898 a great many of them were consumed. They are dug up in June or July by squaws with a "potato stick," a simple sharp-pointed instrument made originally of mountain mahogany (Cercocarpus), or nowadays of iron, and are brought together in varying quantities for roasting or cooking. They are sometimes boiled, but the general method as described to me by a Yuki squaw is as follows: Several families get together in the evening with their supply of the bulbs. A hole of appropriate size is dug in the ground and lined with stones. A fire is then built in the hole and after it has died down the ashes are thickly covered with pine needles. The bulbs are spread upon this, another thick layer of pine needles is added, and the whole is well covered with dirt. A small fire is kept burning over the hole for the remainder of the night and all next day, when the bulbs are removed and divided among the owners. While raw the substance of the bulbs is crisp, white, and very mucilaginous, but almost tasteless; when cooked as described above, however, they are remarkably sweet, the long baking having evidently converted the mucilaginous substance into sugar.

Great care is exercised in preventing the poisonous bulbs of Zygadenus from becoming mixed with the mess. The two are almost precisely alike in general form and appearance.

Wä-chök' and *chū-ös'* are two other names less frequently used for the plant by the Yukis; *bi-tē'* is the Pomo name. A very similar bulb is called *lam'-chē* by the Little Lake Indians. It is described as flowerless and as being very bitter when raw.

Triteleia laxa Benth.

Tē-lā' bö (Little Lake).—The most abundant and widespread of all the Indian potatoes (fig. 70). It grows in fields, especially on the hills, and is known as the "highland potato." In one clump observed



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by the writer it was estimated that there were over 200 plants in 1 square foot of ground. The plant very closely resembles the harvest brodiaea (*Hookera coronaria*), but the flowers are more numerous—from 10 to 30—and narrower, and have a much less succulent texture. The figure here given represents a plant cultivated in the greenhouse at Washington. The sweet bulbs are especially esteemed for food by the Yukis, who call the plant *ānt-pot'*. The Yokia name is *bö lä*, the Wailaki *gön'-cha*.

Triteleia peduncularis Lindl.

Lat (Yuki).—A white-flowered brodiaea, very similar in general form to an overgrown specimen of the last plant. All of the parts, however, are larger and the flowers are more numerous. It is a very handsome species, which is rather common in the wet meadows of Round Valley but attains its most robust development in proximity to springs on the open mountain sides. The bulbs are used to some extent for food.

CONVALLARIACEAE. Lily-of-the-Valley Family.

Trillium sessile giganteum Hook. & Arn.

Zhâl-zhoi'-ē (Yuki).—The common liver-colored or white trillium, which grows in the shade in damp valleys and along shaded streams throughout the district. The tuber-like rhizomes are used in medicine, but are so intensely bitter that the Indians use them internally only as a last resort. The exact application could not be ascertained, but the Wailakis and Yukis drink a decoction of it apparently for the purpose of preventing deep and lasting sleep. They describe it as good for "any kind of sick." Both the bruised leaves and crushed root are used as a poultice for boils. One application lasts for two or three hours, after which time it is renewed again and again for about two or three days when the boil has been brought to a head. The Wailaki name for the plant is *bē-cha'-te-chū*; the Little Lake *ki-kä'-hī-um*. It is considered of no value by the latter tribes; the Concows consider it poisonous.

SMILACEAE. Smilax Family.

Smilax californica Gray.

This, the only native species of Smilax in California, does not occur in Mendocino County, but is common along the head waters of the Sacramento. The fine long trailing limbs are exceedingly strong and are used to some extent in Round Valley and perhaps at Ukiah for basket making. The Indians state that the strands have a natural brownish-black color.

IRIDACEAE. Iris Family.

Iris douglasiana Herbert.

Si-lim' (Pomo—several tribes).—The common flag of the region, which grows in clumps a foot or so high, on hillsides throughout the country. The edges of the leaves are as fine and strong as silk and used to be gathered for the purpose of making the strongest kinds of nets and ropes. As the margin of the leaf is alone used, the work of making anything from it was exceedingly laborious. The silky strands were separated from the leaf and thoroughly cleaned from other tissues by means of a sharp-edged oblong piece of abalone shell, which was fastened to the thumb and used to scrape the fiber. Frank Youree informed me that it took nearly six weeks to make a rope twelve feet long. The rope, which was exceedingly strong and very pliable, was especially valuable in making snares to catch deer, and on this account it was known as "deer rope." Very few of the snares are now in the possession of the Indians, but one man at Round Valley recently made several to sell to a dealer in Indian curios at Ukiah.

A very novel use of the leaves was made a long time ago by the Yokia squaws and was related to me somewhat as follows: When, in their search after manzanita berries on hot, dry hillsides, they were compelled to take their babies with them, they would wrap them up well with the soft, flexible green leaves, and thus, by retarding perspiration, save them from extreme thirst. The Yuki name for the plant is *chē-wish';* the Wailaki, *zhe-lä'-tsā''-chit.*

ORCHIDACEAE. Orchis Family.

Limodorum giganteum (Dougl.) Kuntze.

Hō-dim' (Yokia).—The leafy brown and green flowered swamp orchis, which grows along mountain streams throughout the region, sometimes known as *Epipactis gigantea* Dougl. Specimens were collected near Ukiah and shown only to the Indians in that locality. They drink a decoction of the roots to combat mania and the most severe cases of illness, when they are "sick all over" and can neither walk nor move.

SALICACEAE. Willow Family.

Populus fremontii Wats.

Pät'-mil (Yuki).—The common or Fremont cottonwood, which is native to the region and is commonly cultivated as a shade tree. A decoction from the bark is used as a wash for bruises and cuts, especially for the sores on horses caused by chafing. The wood is used to a slight extent for fuel.

Populus trichocarpa Torr. & Gray.

Pät'-mil (Yuki).—The same name is applied to this tree as to the above species. It is commonally known as the "black cottonwood" or "balm cottonwood." It grows sparingly along the larger mountain streams, and is also cultivated for shade and ornament. In summer the leaves fill the air with their sweet balsamic perfume, which vies strongly with that from the buckeye, the wild lilac, and some of the tarweeds in making the whole air redolent. No special use was noted for any part of the tree.

Salix argyrophylla Nutt.

Bäm kă-lā' (Pomo).—The shrubby white-leaved willow, which is common along the broad, gravelly bed of the Russian River near Ukiah. It is not found at Round Valley. In both regions, however, it is considered to be the best willow for the coarse baskets usually seen lying about the Indian villages. The Round Valley Indians often carry back small supplies of the slender wands when they return from hop picking near Ukiah, but their coarser baskets are not usually made of willow though this is the case with those manufactured near Ukiah. The roots are more highly valued in making certain baskets, but the kind was not ascertained. The straight wands are made into arrows, and the larger limbs are frequently used in making weirs in which to catch fish. The Yokia name of the plant is *kä-läl'-nō.*

Salix lasiolepis Benth.

Shkä (Yokia).—The commonest willow of the region, a tree 40 to 60 feet in height, with smooth bark and coriaceous, lance-like leaves 4 to 6 inches long by about 1 inch in width. No flowering or fruiting specimens were observed, but the tree most probably belongs to the above species. It grows along streams in wet soil. When a recently cut sapling is placed in wet ground it will generally continue to grow. At one place in Round Valley an inclosure used as a dancing place had been made by planting the recently cut poles within an inch or two of each other and arranging them in the form of a circle around a small tree, leaving a wide opening for the entrance. The leaves, which soon sprouted all along the poles, together with the dead leafy branches arranged on top, afforded ample protection from the sun and wind. The branches are very commonly chopped down and used for shade around houses, being thrown up as a rude kind of thatching. The wood is more highly esteemed for fuel than is oak.

In former times the tough, fibrous inner bark, called *sĕ-äm'* by the Pomo, was collected in spring and manufactured into rope, and into a rude garment or cowty, called *mä-lō'mä-lō'*, which consisted of a large number of vertical strap-like bands, each of which was fastened closely together at one end to another band which served to girdle the garment over the loins. A portion of the inner bark was also used by the Indians as a substitute for chewing tobacco. It was gathered in quantity at the proper season, dried, powdered in a mortar, and thus preserved for future use. One white man who had learned to use it many years ago told me that he still preferred it to tobacco, although he was also fond of the latter article. The dried and powdered leaves are also sometimes mixed with tobacco and used for smoking.

Very considerable use is made of the bark in medicine. A strong decoction is used externally as a wash for the itch; internally it is used as a tea to cure the chills and fever, and in large quantities to cause profuse sweating in almost any disease. The root bark is preferred in the latter case. An infusion of the leaves is said to be useful in checking diarrhea. The Pomo name given by Dr. Hudson for the tree is *be-hé*.

BETULACEAE. Birch Family.

Alnus rhombifolia Nutt.

Um'-sē (Yuki).—The common mountain alder of the region, a large tree, 30 to 50 feet in height, with smooth white bark and velvety glutinous leaves. It grows along the larger mountain streams and in wet places generally, a little clump of the trees frequently marking the presence of springs, which are often known as alder springs.

The bark is very astringent and somewhat bitter, and contains a peculiar dyestuff. A decoction is made of the fresh or dried bark which is used copiously to produce perspiration, as a blood purifier, and sometimes to check diarrhea caused by drinking bad water. In appropriate doses it is used to allay stomach ache, to facilitate childbirth, and as a cure for consumption by checking hemorrhages. For the latter purposes it is claimed to be " better than doctor's medicines." Mixed with Indian tobacco it is used to produce emesis.

The fresh bark is used occasionally to color basket material, and was formerly used to a slight extent to color deerskins, the color being imparted in some way by the smoke or perhaps the vapors from the slowly burning bark. A still more novel use of the dyestuff consists in the practice formerly made by the Wailaki Indians of chewing the fresh bark and coloring their bodies with the red saliva for the purpose of facilitating the capture of the red-fleshed salmon, which, during the spawning season, run up the rivers and large streams in immense numbers. The color, which is somewhat resistant to water after having been thoroughly dried on, is supposed to favor the success of a big catch. The fish are driven into the nets by naked Indians. The trick is believed to be one, as the chief of the tribe explained, which was first made use of by the crafty coyote.

Arrows were sometimes made out of the young shoots, and the soft wood was particularly valuable for tinder. The dry rot from the wood when mixed with the powdered bark of the Bigelow willow (*Salix lasiolepis*), is considered to be an excellent poultice for burns. *Jus-ki-at'* and *kus* are two Wailaki names applied to the tree; the Pomo name is *gä-shēt'-i*.

Corylus californica (A. DC.) Rose.

Ol mäm (Yuki).—The hazelnut, which is very common in open hillside woods and in canyons throughout the county. The rich, nutritious nuts are gathered by the sackful in autumn, and a supply is kept on hand all winter and the following spring. The slender twigs are very commonly used in place of willow at Round Valley for the coarse sieve baskets and for vertical withes in the saw-grass baskets. A baby-carrying basket observed at Ukiah was made by a man out of hazelnut wands, and several fish traps observed at Round Valley were probably constructed out of the same material. The traps, which are designed for catching salmon, consist of two very coarse-meshed conical baskets, one of which, the outer, is from 5 to 6 feet long and about 3 feet wide at the mouth. The other is of equal diameter at the mouth, but only a foot or so high, and has the apex cut off so as to leave a hole large enough for the salmon to pass through. The two baskets are fastened together in telescope fashion and securely placed in an opening in the weir or dam constructed for the purpose. The salmon are easily caught in the trap in their attempts to pass along in the stream. Frequently, however, they are frightened into it by the Indians. The Concow name of the plant is *gōm'-hé'-ni*; the Wailaki, *ch'kī*; the Little Lake, *chä-bä'*.

FAGACEAE. Beech and Oak Family.

Castanopsis chrysophylla (Hook.) DC.

No Indian name was learned for the "golden-leaf chinquapin," or "California chestnut," which not infrequently attains the dignity of a large-sized tree in this county. In general appearance it is much like that of the Eastern chestnut, but the burs and nuts are smaller, and the leaves are short, with entire margins. The lower surface is densely covered with yellowish scales. Two or three Indians informed me that they sometimes collected the nuts for food. They are eaten to a greater extent by more northerly tribes.

Quercus spp.

ACORNS AS FOOD.

The great bulk of the vegetable food stuffs formerly supplied by nature to the Indians of the interior part of Mendocino County consisted unquestionably of acorns, and even at the present day this nut enters very largely into their diet throughout the whole year. The broad and stately white oak (*Quercus lobata*, Pl. XVII), is the most characteristic tree of the best farming land of the region, but in every locality throughout the county there are one or more different species of oak which furnish in good seasons a great abundance of acorns, which, although not edible in the raw condition, are converted by simple processes into a very satisfying and wholesome diet. The Concows especially, who are not used to eating much meat, claim that they never get sick from eating the mush and bread made from acorns. As a class these nuts are oily, and hence they replace in a measure the oily fish more largely consumed by the coast Indians. They are, however, lacking in proteid matter.

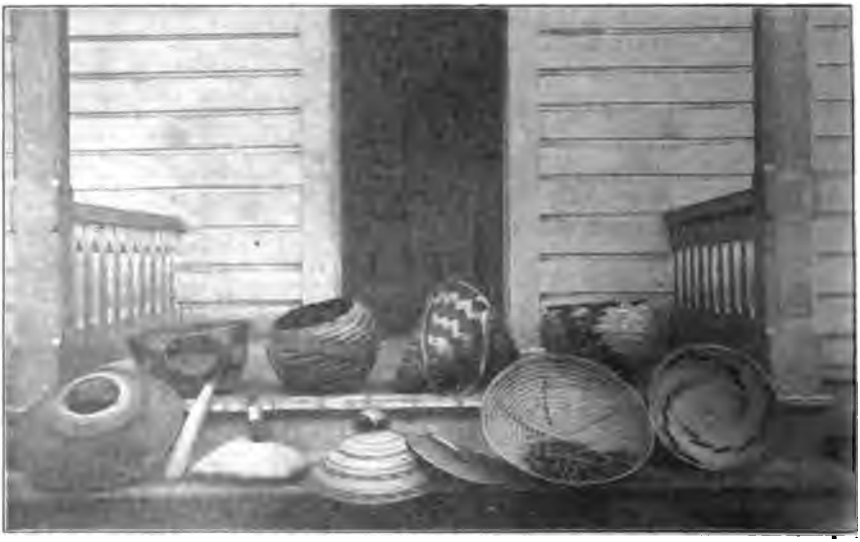

FIG. 71.—Acorn flour outfit.

All contain a small quantity of tannin, which produces an astringent effect upon the tongue, and a greater or less quantity of some glucoside, which causes them to taste bitter. Both of these substances must be removed before the acorns are eaten. This appears to be occasionally accomplished by burying the acorns in a sandy place with grass, charcoal, and ashes, and then soaking them in water from time to time until they become sweet. This method was seen in operation at only one place in Round Valley. The usual method is very different, far more interesting, and in several ways exceedingly instructive, both to the farmer and to the scientist. The whole process of soup and bread making, as I have seen it carried out both at Round Valley and at Ukiah, is here given in detail.

When the acorns are ripe in autumn the men go out and beat them off the tree or cut off the small branches and throw them to the ground.

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The squaws collect them in a large conical carrying basket like that represented in fig. 71. These are carried on the back, but are suspended by a broad band from the forehead. Both hands are therefore free for picking up the acorns, which are thrown backward with unerring aim into the basket. As much as seven or eight large basketfuls—some 400 or 500 pounds—may thus be gathered by one family for a year's supply. At home the nuts are first spread out in the sun until thoroughly dry, when they are sometimes cracked either with the teeth or by means of a small stone and still further dried for future use, or are stored away in the houses with the shells on. In former years special receptacles made of coarse withes were erected and these were more or less directly exposed to the weather. Considerable care is exercised in keeping them from becoming moldy.

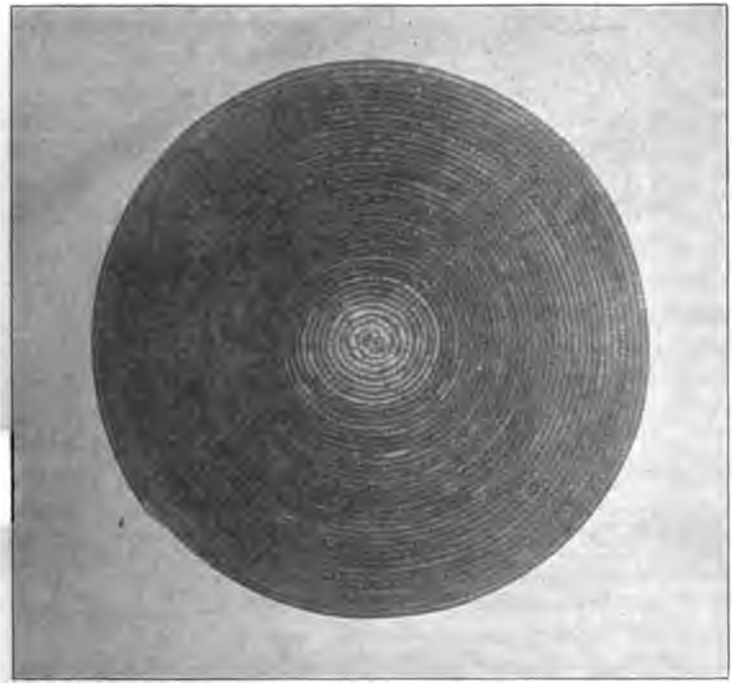

FIG. 72.—Separator for removing coarse particles of acorn meal.

When ready for use the kernels are usually dry and rather brittle. They are first thoroughly pulverized in a curious mortar, which consists essentially of three parts—a large, flat stone; a shallow, basin-like, but bottomless basket, and a stone pestle. These various parts are shown in Pl. XVIII, fig. 2. The basket is held in place on the stone by the legs of the operator—always an old squaw or a superannuated brave, who alone has the requisite patience and unlimited time—and the pounding is done upon the flat stone, as shown in the figure. The basket serves admirably to prevent the particles from flying away,

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and it fits so closely and is held so firmly to the stone that no meal is lost. This process requires a very considerable amount of time, and consequently the everlasting thump, thump, thump, of the pestle is a characteristic sound heard at many of the Indian settlements about midday.

Although the meal thus produced is quite fine, it is mixed to a greater or less extent with coarser particles, which are most carefully removed in the following manner: The meal is spread out evenly on the separator, a circular piece of basket-work shown in fig. 72, and then the separator being held inclined toward the body, the meal is, by vigorous shaking, thrown up and down upon it until all of the coarser particles have rolled off into the basket which has been placed to receive them. This product, however, is not considered fine enough. The meal is easily loosened up by tapping the plaque gently. The shaking operation is then repeated again and again until at about the seventh time it adheres so firmly that it has to be beaten off by sharp blows with a long bone which is kept at hand for the purpose. Any stray bits of meal that have dropped around the baskets are carefully scraped up from the ground by means of a brush made of the outer fibers of soap root (*Chlorogalum pomeridianum*) and carefully added to that which has to be reground. Very little dirt gets into the meal in this way, for the ground is either so selected as to have a hard, damp, and even surface which can be kept free from superfluous dirt by sweeping, or, which is more generally the case, it is already hard and greasy from long-continued use.

The meal thus carefully ground is still astringent and bitter on account of the tannin and the bitter principle which the acorns contain in quantities varying with the different species. Both of these substances are deleterious to health and interfere with digestion, and hence it has been found necessary to remove them as completely as possible before the meal can be used for food. Water will remove both. It would, however, be practically impossible to dissolve them out from such an oily material if the meal were not first ground to an impalpable powder. The reason for taking so much pains in that process is therefore quite evident; a very great additional advantage lies in the fact that the finer the meal the more easily and fully it is digested.

The process of removing the bitter substance and the tannin is essentially the same with all the tribes, and consists in mixing the meal with water in a shallow depression which is made in sand or some porous material and allowing the water to percolate through the mass until the bitter taste has disappeared. A couple of hours are usually required for the operation. As originally carried out this filtration was done in sandy soil, and that is the kind of place still preferred; but since the Indians have been located on farms of their own, several have erected special sand filters and a few of them have substituted other material. One consisted of a low framework supporting a lot of dry pine needles which were arranged in the form of a basin and covered with a piece of ordinary gunny sacking. This had the advantage of keeping the meal entirely free from sand. Very little of that material is mixed with the meal in the ordinary process, however, for precautions are taken to guard against it. The sand is patted down well and sometimes a bed of leaves serves for a foundation. In pouring fresh supplies of water on the meal some thick material, like the leafy branch of the incense cedar (*Libocedrus decurrens*) or a small tule mat, is first spread over the top so that the water will flow gently all over the meal. The cedar is preferred on account of the balsamic flavor which it imparts to the meal, and it is used in subsequent operations also for the same qualities.

The acorn meal after this process has the consistency of ordinary dough. It is sometimes converted into bread while still in the sand by building a fire around it; but this method is objectionable on account of the sand which adheres to the bread and the loss of the oil, which, when hot, passes into the sand. A considerable quantity is scooped out from the center of the depression, and this, which is entirely free from sand, is reserved and afterwards made into bread. The remainder of the dough, with, perhaps, a little of the adhering sand, is rubbed up with varying proportions of water in a large "feast basket" like one of those shown in figure 71, and in this it is converted into soup. The sand rapidly settles to the bottom and does not, therefore, contaminate the soup in any way. Water-tight baskets were the only cooking vessels which the natives originally possessed, and they are still very largely used in the process of soup-making, the source of heat being hot rocks, which are placed in with the meal and water. Two pieces of green wood, used like a pair of tongs, serve to carry the rocks from the fire to the basket and again to the fire. Before being placed in the basket, however, each is sometimes washed free from ashes by plunging it once or twice into a basin of water. When cooked, the mush has very much the same appearance as corn-meal porridge, but is usually brownish red. It has a slightly sweetish taste, but it is, on the whole, rather insipid and unsavory. Nevertheless, it is very much esteemed by nearly all of these Indians even at the present time, and many Americans who are more or less accustomed to it prefer it to other kinds of mush. According to its consistency, or to the whims of the eaters, it is eaten by dipping one, two, or three fingers into the basket, which serves as a common receptacle, and thus conveying the thick, gruel-like soup to the mouth, or it may be dipped out by a big mussel shell. This shell is known to the Yukis as *nok*, a name which they apply to spoons also. Spoons and separate dishes have been recently introduced. No salt is used in the mush, although it is generally used with all kinds of pinole.

The dough selected for acorn bread is mixed with red clay before it is baked, the proportion being about 1 pound of clay to 20 of dough. This clay, several Indians explained, makes the bread sweet. Others stated that it "acted like yeast." The mixture is placed on a bed of soaproot, oak, maple, or even poison-oak leaves, which in turn rests on a bed of rocks previously heated by a small fire. The dough is then covered with leaves and a layer of hot rocks and dirt and cooked gently in this primitive oven for about twelve hours, usually over night. When removed the next morning the bread, if previously mixed with clay, is as black as jet, and, while still fresh, has the consistency of rather soft cheese. In the course of a few days it becomes hard, when, on account of the leaf impressions stamped upon it, it might easily be mistaken for a fossil-bearing piece of coal. It is not at all porous, being as heavy as so much cheese. It is remarkable for being sweet, for the original meal and even the soup are rather insipid. The sweet taste is very evident, and is due in great measure to the prolonged and gentle cooking, which, favored by the moisture of the dough, gradually converts some constituent of the meal into sugar, as in the case of camas bulbs.

One or two specimens of bread observed, which were made without the addition of clay, were also sweet. These varied only in color. They were not black, but varied from light tan to dark, reddish brown. All were oily, and about equally heavy. It is evident, therefore, that neither of the above explanations given by the Indians for the use of the clay is satisfactory.

Among the explanations given by others for the use of this material the following are of interest: The preference for black colors, as shown in the uniform practice of blackening basket materials, and in several ways; the absorption by the clay of the oil, which might otherwise be lost in cooking; the dilution of the bread, to make it last longer, or to assuage hunger temporarily, a purpose for which it is claimed by many persons clay is used by primitive people in tropical or subtropical countries throughout the world; ceremonial purposes; the killing of intestinal worms; for the arsenic contained in it; or, finally, for the bone-forming material it contains, this being held to be especially important in the case of people who get most of their nourishment from vegetable matter. It is not my desire to discuss here these various explanations, but I wish to give a scientific explanation which has suggested itself to me. It seems certain that the clay is used for a very scientific and useful purpose, and that is to convert the last trace of tannin still remaining in the dough into an insoluble form. The black color is unquestionably due to the tasteless insoluble compound formed at the baking temperature, under the influence of air and moisture, by the action of the tannin of the acorn with the oxide of iron contained in the clay. An analysis of a sample of this clay, made by Dr.

Walter C. Blasdale at the University of California, showed that it contained no arsenic nor any other interesting ingredient, except the hydrated red oxide of iron, which was readily extracted with hydrochloric acid, and was present to the extent of 10 per cent by weight. Experiments made by Dr. W. D. Bigelow, of the Division of Chemistry, and by myself, showed that acorn meal containing 6.63 per cent of tannic acid was made black, and at the same time sweet, by simply keeping it heated in the moist state at a boiling temperature, with a 1 per cent addition of ferric oxide for about twenty-four hours. A mixture of tannic acid and oxide of iron also turned black after exposure to the same treatment. The absence of disagreeable properties in the clayless bread may be accounted for by the use of an acorn containing less tannin, or by assuming that the meal was more thoroughly washed. An analysis made by Charles D. Woods, director of the Maine Experiment Station, of a sample of bread made without clay from the acorns of the valley white oak (*Quercus lobata*) showed that, while the unleached meal contained 6.63 per cent of tannin, the bread itself contained only a trace. Professor Woods's analyses of the acorn meal and bread are given by percentages in the accompanying table:[1]

Composition of meal from the acorns of the valley white oak (Quercus lobata) *with the bread made from it.*

	Laboratory No.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates.	Ash.	Food value per pound determined.
Acorn meal........	6184	....	8.7	5.7	18.6	65.0	2.0	2,180
Acorn bread.......	6185	....	60.3	2.2	9.9	27.0	.6	1,003

All of the processes as above described are the more interesting because they are undoubtedly wholly original with the aborigines of California. For untold centuries they have been thus using a crop which is particularly abundant throughout California, and of which little use is made by the white people of to-day, other than as a means of fattening hogs. These animals are commonly allowed to run wild through the forest the whole year round, and are slaughtered only in late autumn, when they are in splendid condition for the market. This is a good practical illustration of the food value of acorns to hogs. Let us see how experimental results and popular usage elsewhere emphasize this value.

An inspection of the above table and a further comparison of figures, published in Professor Wood's bulletin above referred to, show that the white-oak acorn (California), which is probably an average for many kinds, is comparatively rich in its contents of carbohydrates and especially fat. Very few nuts contain so much of the former, and the fat content far exceeds that of the almond and is nearly equal to that of the hickory nuts. The calorific power exceeds that of the chestnuts, filberts, cocoanuts, Brazil nuts, almonds, and a few other nuts. An Englishman who had had considerable experience in fattening hogs for the British market estimated that if a hog is fed a peck of acorns, together with a little bran, it will increase a pound a day for two months together. The same authority states that horses, cattle, and sheep may be taught to eat acorns, and that chickens eat them readily after they have been softened by boiling. An extensive, interesting, and very satisfactory experiment in fattening hogs with acorns was made in 1898 by G. W. Carver, director of the Tuskegee Agricultural Experiment Station, Tuskegee, Ala. One great advantage in their use in France is the production of a quality of lard which is especially esteemed in large factories for absorbing the odor of flowers. In this capacity it becomes the vehicle of the most delicate perfumes.

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[1] Maine Agr. Expt. Station, Bul. 54, pp. 79, 80. 1899. Also in letter to author.

In England crude acorns have occasionally been condemned as fatal to hogs, but no such complaint has to my knowledge been made anywhere in California. It would seem, therefore, that the tannin and bitter substance can be ingested by these animals with impunity. It is difficult, however, to conceive why they should not be affected thereby, and it seems certain that if such good results are obtained by allowing the animals to eat the crude nuts, far better results would accrue if care were taken to grind the acorns and to leach out their objectionable constituents.

For human food different kinds of acorns have been especially esteemed in ancient Greece and in France, and are now used throughout the Mediterranean region, Mexico, and the southern United States. In most cases, only the sweet acorns, which contain little or no tannin, have been used, and in no case, except in California, so far as I have learned, has any extensive manufacturing process been adopted to prepare them for eating. One process was, however, employed in the eastern United States in early times. The nuts were boiled by the Indians in water containing the ash of maple wood, in order to extract the oil, which was used with their meat. In Spain and Italy, according to Memmo,[1] sweet acorns are used by the poorer people to the extent sometimes of 20 per cent of their total food. The tannin is not extracted and the nut is not even reduced to a fine meal for better or more complete digestion. Nutrition experiments made on men showed that over 10 per cent of the acorns passed undigested in small fragments into the feces. Much of this loss and the consequent deficiency in food value is unquestionably due to the lack of proper preparation. Its value as a fattener was admitted.

All kinds of acorns are appreciated by the Indians of Mendocino

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[1] Memmo, Giovanni, The Alimentation of Individuals of Different Social Conditions (trans.). Ann. d. Ist. d' ig. sper. d. Univ. di Roma, n. ser. vol. 4. 1894.

County for their fattening power, and it is remarkable, especially in early life, how fat they become on this diet. Those acorns which contain the most oil are most highly valued for food, and it was the meal from these that used to be employed by the squaws to groom their warriors after they had returned from battle. The annual harvest was in former days heralded by a kind of thanksgiving dance, and during this performance a special acorn song was sung. The Concow version of this, given by Powers,[1] is as follows:

Hu′-tim yo′-kim koi-o-di′.

The acorns come down from heaven.

Wi′-hi yan′-ning koi-o-di′.

I plant the short acorns in the valley.

Lo′-whi yan′-ning koi-o-di′.

I plant the long acorns in the valley.

Yo-ho′ nai-ni′, hal-u′-dom yo nai, yo-ho′ nai-nim′.

I sprout, I, the black acorn, sprout, I sprout.

The possession of specially fruitful areas of oak trees was not wholly common a half century ago to the particular tribe, but certain trees and certain small tracts were owned and cared for by a single individual or by a family. Among the Pomos especially the possession of a greater or less number of oaks, manzanitas, peppernuts, and, perhaps other trees, was to some degree a measure of wealth. The parched acorns were to a slight extent used with barley as a substitute for coffee by some of the Spanish settlers. As the bitter principle is still present in the decoction, it is quite probable that some physiological effect is produced by it.

OTHER OAK PRODUCTS.

A few notes on the medicinal use made of oak galls and bark are given under *Quercus lobata*. No particular application seems ever to have been made of the filtrate from the acorn meal. It could be very easily collected in the modern processes of filtration.

Oak wood is used very little for fuel or timber, but some kinds are frequently used for making tool handles, mauls, and paddles. The bark taken from the fallen trees is especially useful in the process of baking and in parching pinole seeds in baskets, because it burns slowly without flame for a long time. Fresh oak bark is occasionally used, together with water and some rusty nails, as a means of blackening basket material. The leaves of the evergreen oaks, especially of the black oak, furnish fodder to stock in exceptionally severe winters. The dried and powdered leaves were formerly used a great deal for tinder.

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[1] Tribes of California, p. 308.

Quercus californica (Torr.) Cooper.

Mom (Yuki for the acorn).—The California black oak, a medium-sized tree with broad, pinnately-lobed, deciduous leaves 4 to 6 inches long, and oblong, obtusely pointed nuts an inch or so in length. It is found here and there in forested mountain districts throughout the county. These acorns are not particularly plentiful, but they are considered to be the second best kind for bread and soup because they are especially rich in oil. The Concow name for the acorn is *hon'-shŏl*, the Wailaki *tol* (the "l" very prolonged) the Yuki, for the tree, *nun*, the Little Lake, *dū-shē' kä-lä'*.

Quercus chrysolepis Liebm.

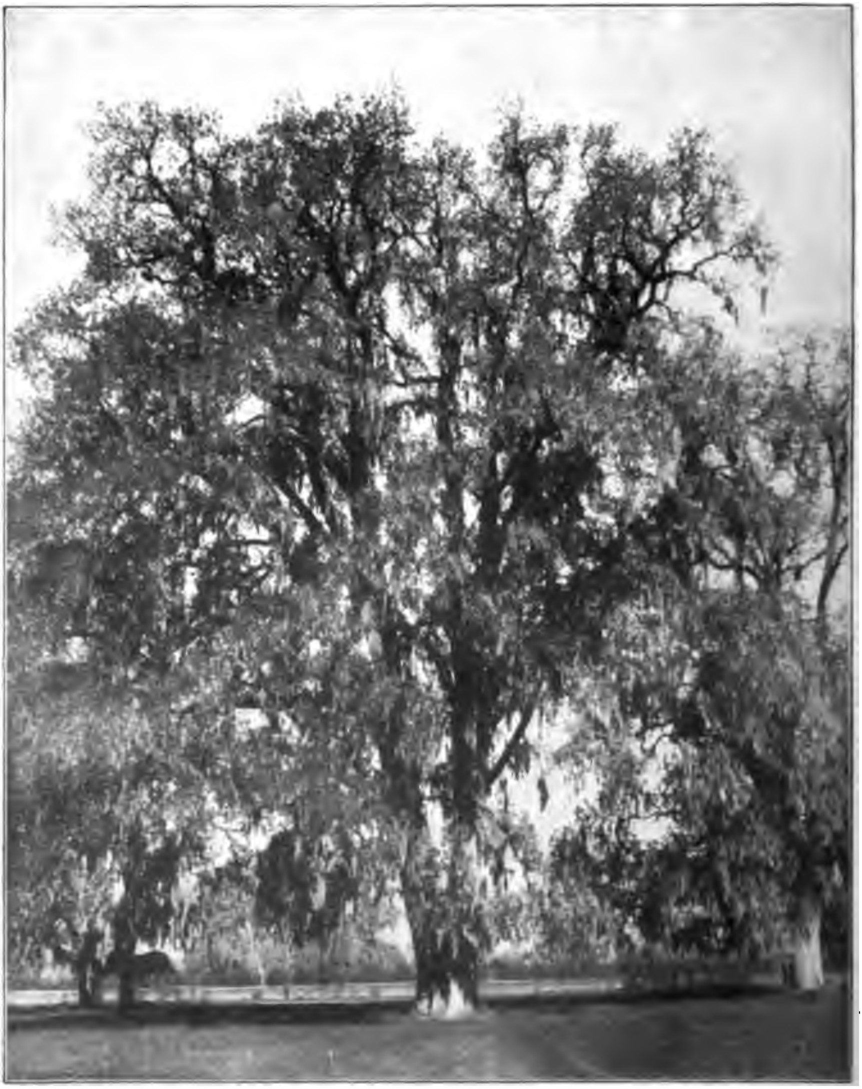
Jē'-jē (Yuki for the acorn).—The canyon live oak, which often grows to be an immense tree in deep canyons throughout the district. It has white, flaky bark, white or pale green, oblong leaves and oval acorns ½ to 1½ inches long. The inconspicuous scales of the shallow cup and the under side of the leaves are often covered with dense glandular yellow hairs. The leaves are rigid, and the margins are often provided with sharp, stout spines, which have given the name pin oak to the tree. The Yuki name signifies sharp-leaf acorn. These acorns are not produced plentifully and the trees are generally more inaccessible than other kinds, and for these reasons the nuts are very little used. One man stated that they were poisonous when raw, and that the meal required more washing than that from other species. The Calpella and the Little Lake name for the acorn is *gä-shä'*; the Yokia, *jesh*.

Quercus densiflora Hook. & Arn.

Shō'-kish (Yuki for the acorn).—The tan-bark oak, a slender evergreen tree which is found in Round Valley, but is more common in moist woods nearer the coast, where the bark is a commercial article, much used for tanning purposes. The pale, oblong leaves, 2 to 6 inches long, with their spiny margins, the erect clusters of flowers, and the long linear scales of the acorn cup are very characteristic, and present strong points of resemblance to the chestnut. The acorns contain a large quantity of deleterious matter, but after being leached they are said to have a very agreeable acid taste. On this account and on account of the extra large amount of oil which the acorns are said to contain, they are preferred to all other kinds. The Concow name for the acorn is *hä'-hä*.

Quercus douglasii Hook. & Arn.

Milk; mē'-lē (Yuki names given for the acorn).—The blue oak, a deciduous tree very abundant on low, dry foothills throughout the county. The sparse foliage, consisting of small, oblong bluish-green



VALLEY WHITE OAK (QUERCUS LOBATA).

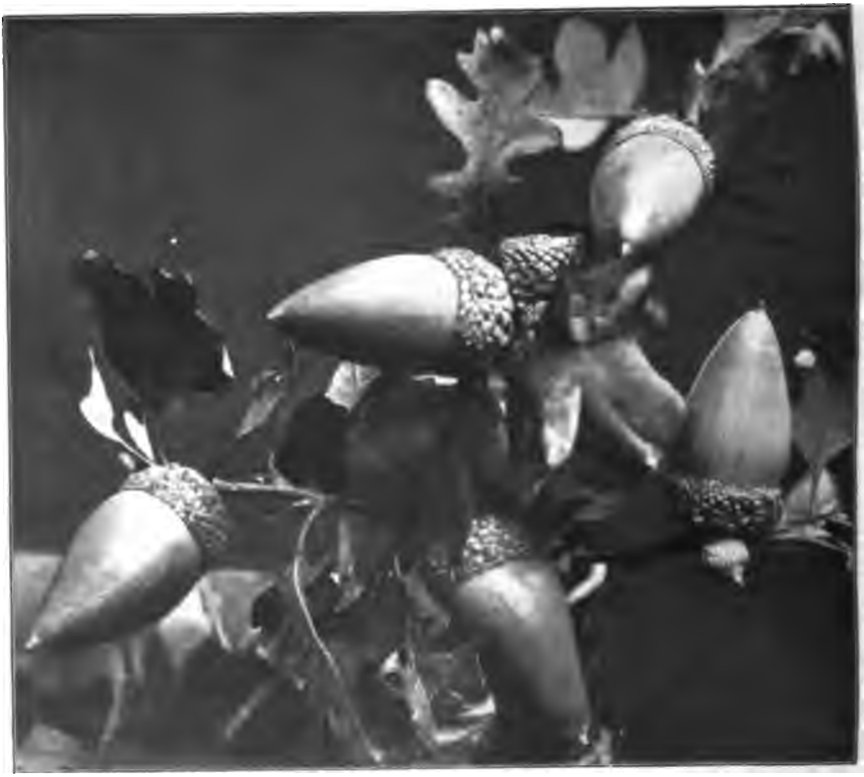


FIG. 1.—VALLEY WHITE OAK ACORNS.

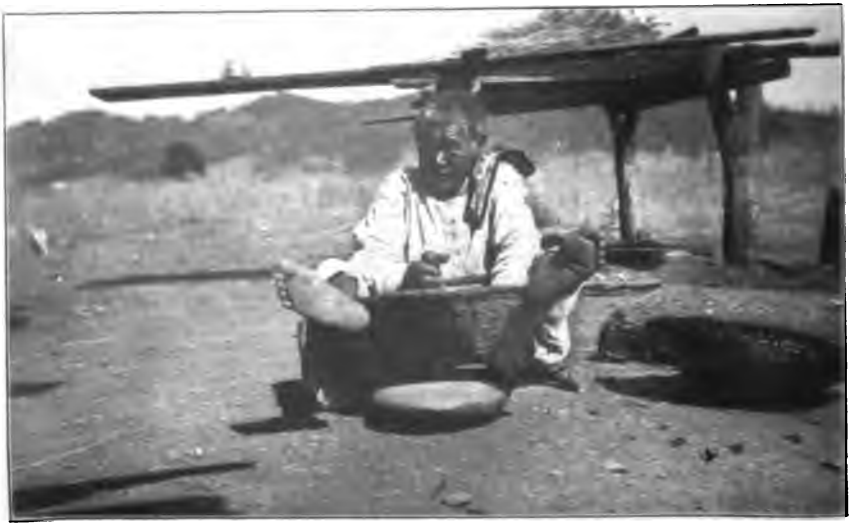


FIG. 2.—YUKI SQUAW GRINDING ACORNS FOR SOUP AND BREAD.

leaves, gives the tree a very characteristic appearance. The thick acorns are a little over an inch in length. They are very largely used for soup and bread.

The Little Lake name for the acorn is *kä-bä'-tä;* the Yokia, *kä-kūl'*.

Quercus dumosa revoluta Sargent.

Bät'-sōm (Pomo).—The curl-leaf scrub oak, an evergreen shrub 3 to 8 feet high, with small, rigid, convex light-green leaves, and small, oval acorns less than an inch in length. It forms dense, impenetrable jungles on dry hills south of Round Valley, and on San Hedrin Mountain. On account of the abundance of the shrub on this mountain the Pomos have called it *bät'-sōm dä'-nō*, the latter word being the name for mountain. The acorns are small and extremely bitter, and are therefore used very little for human food.

Quercus garryana Dougl.

Mā-lē' (Yuki).—The Pacific post oak, or, as it is more commonly called in this region, mountain white oak. It resembles the valley white oak both in size and appearance of several of its parts, but may be readily distinguished therefrom by its larger and more prominently veined leaves, its hairy winter buds, and the small lanceolate and slightly pubescent scales of the shallow cup as well as by its habitat, it being confined principally to the lower hills instead of the level valleys. The acorns are used for food in the same manner as other acorns are used.

Quercus lobata Née.

Kī-yäm' (Yuki for the acorn).—The common valley white oak (Pl. XVII), a stupendous wide-spreading tree often 80 feet in height. One tree measured 24 feet 3 inches in circumference, but they are occasionally much larger. It grows in broad, fertile valleys throughout the district, and as the individuals always grow scattered in grassy meadows they give the valley a magnificent park-like appearance. The drooping branches tasseled with moss add much to their picturesque beauty. The long acorns (Pl. XVIII, fig. 1) are very characteristic of the tree, since they often vary from about 1¼ up to 2½ inches in length. They are the largest of all the acorns, and since the enormous trees generally yield an abundant harvest which is conveniently located with respect to the Indian villages they are the chief source of the acorn supply. The bread made from them is called *pä'-önsh* by the Yukis. The bark is used to a very slight extent by the Yukis to check diarrhea and to a slight extent also by the Concows to blacken strands of the red bud for use in basket making. Rusty iron is added to the water extract of the bark to produce a black solution, in which the strands are allowed to remain for some time. The Wailaki name for the acorn is *skin'-chön;* the Little Lake, *sē-pä'*, and the Concow, *lō-ē'*.

considerable part of the year. The leaves are used, and even cultivated, for greens, and the seeds were formerly used to a very small extent for mush.

CHENOPODIACEAE. Goosefoot Family.

Chenopodium album L.

No Indian name was obtained for the pigweed, or lamb's-quarters, which is a common weed about houses. This plant was unknown to the Indians originally, and but few of them have any uses for it. One Indian informed me that the old leaves were good to relieve stomach ache, and several stated that they had been taught to use the young leaves for greens. The first boiling water is always thrown away on account of its bad taste.

AMARANTHACEAE. Amaranth Family.

Amaranthus retroflexus Linn.

No Indian name was learned for this plant, which is well known as hogweed throughout the district. It is an exceedingly troublesome weed to those Indians who attempt to do much farming, but to many its small, shiny black seeds, which are yielded in great abundance, are a source of good pinole.

PORTULACACEAE. Purslane Family.

Calandrinia elegans Spach.

Jin-net' (Numlaki).—A small, low annual, with very showy rose-red flowers and succulent leaves and stems. It is an early spring flower which grows in open fields in many parts of California. Several pounds of the tiny jet-black seeds, which look like so many grains of gunpowder, were observed in the possession of a Numlaki squaw, who used them for pinole, and who had gathered them near the former home of her tribe in Tehama County, where the plant is probably very abundant and productive. A very similar but smaller-seeded species, *C. menziesii*, grows to some extent in Round Valley, but so far as learned the seed was not used for food.

Claytonia perfoliata Donn.

Gō-shin' (Yuki).—A plant which is conspicuous for its tuft of succulent, long-stemmed, orbicular leaves, from the center of the upper side of which a few inconspicuous white flowers protrude. It is a common plant under oak and laurel trees in winter and is well known as Indian lettuce. This whole plant is either eaten raw or cooked up with salt and pepper for greens. It is used by white people also.

NYMPHAEACEAE. Water Lily Family.

Nymphaea polysepala (Engelm.) Greene.

The common yellow pond lily of California, known by some authors as *Nuphar polysepalum* Engelm., grows profusely in shallow lakes and winter ponds in the moist coast region, but is only very sparingly represented in Round Valley. The fleshy roots are a favorite food of deer, and the rich, nutritious seeds are eaten by the Indians whenever they can get them.

RANUNCULACEAE. Crowfoot Family.

Clematis ligusticifolia Nutt.

No Indian name was learned for the common virgin's bower, or pepper vine, of the region, a conspicuous vine climbing high over trees and in summer displaying large clusters of dull white flowers or silky, feathery achenes. The stem and leaves have an acrid, peppery taste and are chewed for the purpose of curing colds and sore throat.

Delphinium hesperium Gray.

Mâl-chū'-lēz (Yuki).—The common blue larkspur, which is abundant on dry, grassy hillsides, and appears sparingly in grain fields throughout the region. Another common name for the plant is "rattlesnake flower." It is suspected of being poisonous to cattle.

Delphinium nudicaule Torr. & Gray.

Sō-mä' yem (Calpella).—The common red larkspur of the region. The name signifies "sleeproot," the root being accredited by one of the Calpella Indians with very marked narcotic properties, which are made use of in causing an opponent to become stupid while gambling. The name "lady's slipper" was applied to the plant by an educated Yuki.

Ranunculus eisenii Kellogg.

Wē (Yuki).—The common five-petaled buttercup of the region. The smooth, flat, orbicular seeds are gathered in great quantity in May and are used either alone or mixed with other seeds for pinole, a favorite mixture being *wē* and *ch' ō'-mel* (Achyrachaena). Both of these seeds may be gathered in May. The acrid principle so characteristic of plants belonging to this group is entirely destroyed in parching the seed.

Tē-lä', the Little Lake name of the seed, is also the name applied to the tick. There seems, however, to be no resemblance between the two. The Yokia name of the seed is *tä-loch'-dō*.

Thalictrum polycarpum Wats.

Hōl'-gä-shēn'' (Yuki).—The common aromatic meadow rue of the region, a plant 3 to 4 feet high with finely divided leaves and inconspicuous staminate or pistillate flowers. The name means "coyote angelica" and the same translation holds good for the Yokia name *ē-wē' bŭch-ō'-ä*. Other tribal names mean substantially the same thing. An instance of the accidental poisoning of a white child by eating the stem by mistake for that of angelica was cited by one Indian. Angelica root is the universal charm and panacea of the Indian, and the coyote symbolizes their ideal of cunning. They have an idea that the coyote is able to eat the meadow rue with impunity, and since it is aromatic like angelica, they call it coyote angelica to distinguish it from the true article. The symptoms of poisoning in the case above mentioned, as described by my informant, were the same as for strychnine. If, however, the poison is analogous to that isolated from a European species (*T. macrocarpum*), the symptoms should be more like those of aconite; but all are somewhat alike in action. The Wailakis have a supersition to the effect that this plant is capable of making dead Indians have bad dreams if it is allowed to grow on their graves. When, therefore, their living friends feel their conscience troubled, they go out to the grave, and, if they find the plant growing there, they dig it up, and, as a sort of propitiation for their neglect, wash their heads with the juice from the crushed stems and leaves. It is also used in this way to cure headache. The Wailaki name for the plant is *chin-dun''-gä'-chit*, the Little Lake *ē-wē' shi-shā'*.

BERBERIDACEAE. Barberry Family.

Berberis repens Lindl.

No Indian name was learned for the Oregon grape or creeping barberry, a low shrub with holly-like pinnate leaves and short clusters of small, sour blue berries, which is common in bleak, rocky hillsides. The yellow root bark is gathered in large quantity and used in the form of a decoction for the cure of stomach troubles and as a blood purifier.

BUTNERIACEAE. Strawberry Shrub Family.

Butneria occidentalis (Hook. & Arn.) Greene.

Sī kä-lā' (Pomo).—The western spice bush or calycanthus, a beautiful shrub with large opposite leaves and solitary velvety-red flowers. It is fairly common in shaded ravines throughout the region. The bark, leaves, and flowers are delightfully aromatic, especially when crushed, and the flower retains its fragrance a half day or so after wilting. The bark is peppery as well as aromatic, and the leaf is slightly bitter. Specimens were shown to but a few individuals. Both the wood and the bark from fresh shoots are used in basket work, and the pithy shoots used to be particularly valued by the Yokia Indians for making arrows, the preference being rated by one individual in the ratio of about twenty to one against all other material.

LAURACEAE. Laurel Family.

Umbellularia californica (Arnott) Nutt.

Pōl'-cum ōl (Yuki).—The California laurel (fig. 73), the most characteristic and beautiful, and at the same time economically interesting tree of the region. It is an evergreen, pyramidal tree, 10 to 100 feet in height, and grows in canyons and damp woods, and sparingly on high rocky knolls where vertical strata permit the tree to send its roots into the ground for water to a great depth. It is most highly characterized by the pungent quality of its leaves. These contain about 7½ per cent of a volatile oil which has an effect upon the tongue and skin somewhat like that of camphor and menthol. The odor from the freshly crushed leaves may provoke headache and bring tears to the eyes, but when this is largely diluted with air it is more or less agreeable and soothing in its effect. All parts of the tree, including the wood, contain aromatic or fixed oils, the characteristic effect of which

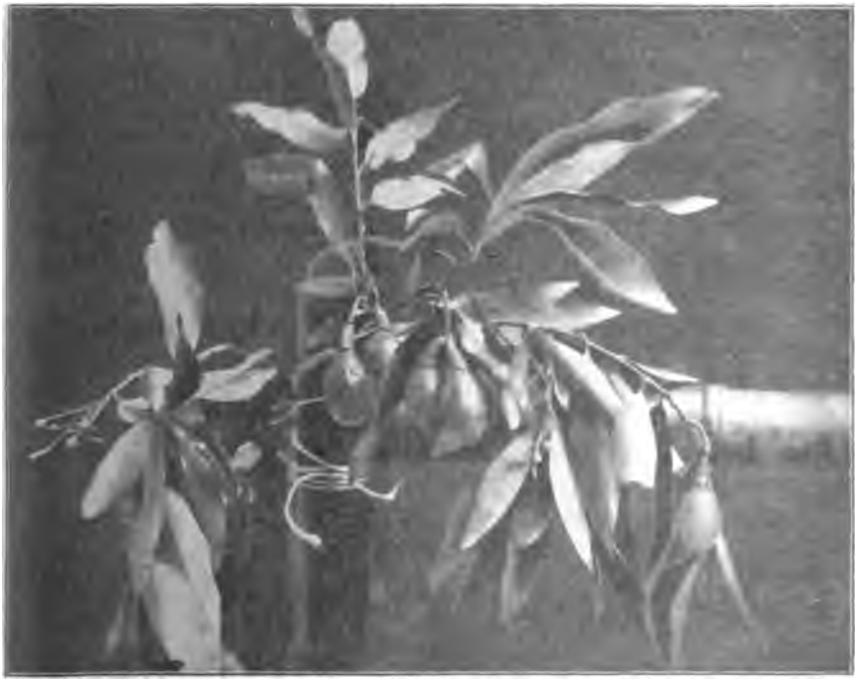


FIG. 73.—Laurel (*Umbellularia californica.*)

is more or less irritant and acrid, an effect which the early settlers compared with pepper and therefore called the tree pepperwood, or, on account of the general use of the nuts for food by the Indians, peppernut tree.

These nuts (*pōl'-cum*) are thin-shelled and nearly spherical, being about one-half inch in diameter. They contain a large kernel and are surrounded by a fleshy covering which makes the fruit look very much like an olive. Both the flesh of the ripe fruit and the kernel are used for food, but the upper two-thirds of the former is rejected on account of the larger amount of acrid oil which it contains. The taste is not at all disagreeable, as might be suspected. The kernel is altogether too acrid to eat until the nut has been thoroughly parched, and even then it has a slight pungency, which is, however, rather agreeable. It was difficult to find out to what extent and for what purpose the nuts are used for food, but a single family often uses 3 or 4 bushels in one year, and many Indians have a considerable supply on hand throughout the whole of the year. Not more than a dozen or two are consumed at a single meal, and therefore it seems probable that they are used either as a relish, condiment, or stimulant. Several Indians informed me that they often took a quantity of the nuts with them when they were forced to take long tramps through the woods or to go a long time without food. The Indians compare them with coffee, and indeed the parched fruit tastes considerably like that substance. They are never used, however, to make a drink of, although the bark of the root is so used, according to an intelligent half-breed Concow. On the other hand, the kernel contains some starch and from 40 to 60 per cent of a peculiar fatty oil which may have some food value. The nuts are roasted and eaten, often with clover, or are roasted, shelled, and pounded up into a small mass, which on account of the large content of oil is easily molded. When so prepared it is called "bread" (*pōl'-cum höt'-mil*) by the Yuki.

A chemical investigation of the fixed oil contained in the nut was made by Prof. J. M. Stillman and Prof. Edmond O'Neil[1] at the University of California, but no dietary or pharmacological work was done upon it.

The medicinal use of the leaves is extremely varied. Their value depends almost entirely upon the pungent volatile oil which they contain, and they are mostly applied externally in the form of a decoction, either for their cooling, irritant, or insecticidal and germicidal effect. To cure headache, a portion of a leaf is either placed in the nostril or several are bound upon the forehead or under the hat, or the head is washed with a strong decoction of the leaves. This is done also to kill vermin on the head. As a counterirritant for chronic stomach complaints a large quantity of the leaves is often tied around the body and left for a couple of days. A decoction is sometimes taken internally to cure both the stomach ache and headache. To cure rheumatism, which is now a common complaint among the Indians, a quantity of the leaves is thrown into a large amount of hot water, which is used for bathing purposes twice a day for two or three days. The oil causes the skin to smart and this necessitates thorough rubbing. The remedy seems to be a good one, for several white people have adopted it. Among the latter, however, the leaf is rubbed up with lard, and used thus in the form of an ointment. It is also claimed that the oil is the chief ingredient of some patent medicines. It is now being distilled in considerable quantity at a few places.

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[1] Am. Chem. Journ., vol. 4, pp. 206 to 211. 1882-83.

The aromatic vapor from the leaves thrown upon a slow fire is highly esteemed as a cure for many diseases, although the leaves are not used in the so-called sweat baths. I am assured that it is not a very uncommon sight to see an Indian standing in the smudge produced by the use of these leaves.

The leaves appear to be very valuable for driving fleas away. One Indian said that they are very effective if strewn about the yard, and one white man assured me that, after spending $10 to $15 on flea powders in a vain endeavor to drive these insects away, he had used laurel leaves with very marked success. The Pomo name for the nut is *bā-he'*, and for the tree *bā-hem'*. *Bok* is the Numlaki, and *sō-ē'-bä* the Concow name for the tree.

PAPAVERACEAE. Poppy Family.

Eschscholtzia douglasii (Hook. & Arn.) Walp.

Hö-yö-con'-el (Yuki).—The light yellow California poppy, which grows in prodigal abundance in open ground throughout the region. The fresh root is placed in the cavity of a tooth to stop the toothache, and an extract from it is used as a wash or liniment for headache, suppurating sores, and to stop the secretion of milk in women; internally, to cause vomiting, cure stomach ache, and, to some extent, as a cure for consumption. An extract of the leaves is used to a slight extent to stop stomach ache. One individual stated that he ate the leaves for greens, but was careful to throw away the water in which they had been boiled. Powers, in his Tribes of California, also notes the use of poppy leaves for food. The root is said to be used secretly by some of the Indians in gambling for its stupefying effect. The Little Lake name for the plant is *tä'-sha-lē;* the Yuki, *do-slū-tit'-is-dō*, and the Wailaki, *tso''-tä-tä-sit'-chö*.

Platystemon californicus Benth.

Pâl'-but, *ink-ō'-um* (Yuki).—The common "cream cup" of the region, a slender hairy annual with small nodding poppy-like buds, and erect cream-colored flowers an inch or so in diameter. It is common in valleys and on grassy hillsides. The green leaves are said to be eaten for greens, but the use is probably rather restricted.

BRASSICACEAE. Mustard Family.

Brassica campestris L.

The common yellow mustard is an introduced annual for which there is no Indian name. It is one of the worst weeds in grain fields. Indians are frequently employed to weed it out by hand pulling. The extensive use of the young leaves for greens by the early settlers has been imitated by the natives.

Bursa bursa-pastoris (L.) Britton.

The common shepherd's purse, a slender introduced annual, the seed of which is used to a slight extent for pinole.

Roripa nasturtium (L.) Rusby.

The common water cress, an aquatic annual, which was introduced by the early settlers, and has now become quite abundant in Round Valley. The leaves are eaten as a relish.

Thysanocarpus elegans Fisch. & Mey.

Ōl-lō'-bich (Yuki).—A slender annual, a foot or so in height, with a long raceme of inconspicuous white flowers, which develop into peculiar lace-fringed, lens-shaped seed pods a quarter of an inch in diameter. The plant grows on low hillsides and is known as "lace-pod." The slightly pungent seeds are used in pinole mixtures and a decoction of the whole plant is sometimes used to relieve stomach ache. The Wailaki name, *bā-ō''-zhe-lä'-dit*, refers to the faint suggestion which the appearance of the fruit has to a dainty Indian basket.

SAXIFRAGACEAE. Saxifrage Family.

Philadelphus gordonianus Lindl.

Hân'-li (Yuki).—A species of syringa or mock orange, which is commonly called arrow wood in Round Valley. It is a magnificent shrub, 6 to 12 feet high, with opposite ovate leaves and clusters of large orange-like flowers. It is not found near Ukiah, but is very common in canyons and damp bushy meadows in Round Valley and is frequently seen in cultivation throughout California and elsewhere. The older, less pithy wood was formerly used to make bows, and the younger, very pithy shoots were, on account of their straightness and their light weight, especially prized for arrows by the Yukis and Wailakis.

Several old-time arrows were observed which were tipped with a solid, sharpened cylinder of oak, mountain mahogany, or dogwood, inserted into the pith at the end of the shaft and neatly bound to it with sinew. Other arrows made by boys for sport were tipped with the butt of a French or wire nail. The feathers, commonly taken from the quail and hawk, are three in number, and are fastened to the shaft with sinew or with pitch. The pithy stems are also valued, on account of their lightness, for the manufacture of baskets used by women for carrying babies. *Kä'-kus* is the Wailaki name for the bush, and *shŏn'-a-hī* is the name used by the Little Lake Indians.

Ribes californicum Hook. & Arn.

Gol-lē' (Yuki).—The common thorny gooseberry of the region, which has a light-red fruit from ¼ to ½ inch in diameter, thickly covered with sharp bristles. It is rather common on dry, rocky hillsides, especially southward. The fruit has a very agreeable, acid taste, but it requires some skill to avoid the prickles. Children eat the fruit directly from the bushes, but some of the older Indians occasionally collect it in quantity and singe off the prickles in a basket with red hot coals before eating it. *Lōm* is the Pomo name for the bush and *tä-rä-tit'* the Yokia name.

Ribes divaricatum Dougl.

Äl-tē''-hēz'-mil (Yuki).—The smooth-fruited species of gooseberry, which grows plentifully in damp ground in canyons, on northern hillsides, and in bushy meadows throughout the region, especially in Round Valley. It has a small black berry which is very juicy and delicious. It fruits well and is eagerly sought after by old and young.

Tellima affinis (Gray) Boland.

Kin-göt-gō' sä (Yuki).—A slender perennial about a foot in height, with a tuberous rootstock, small, palmately-lobed root and stem leaves, and a short raceme of white flowers which have five irregularly cut petals. One individual informed me that the root was chewed to relieve colds or stomach ache, but this information was not volunteered by others, and it may, therefore, be erroneous.

Therofon elatum (Nutt.) Greene.

No Indian name was learned for this delicate aromatic-scented perennial, sometimes known as *Boykinia elata*, which grows about a foot in height on wet, mossy banks near the creek, in deep canyons. It has large, thin, palmately-lobed leaves and a terminal raceme of small white flowers. A Yuki Indian informed me that the roots were used medicinally, but for what particular purpose he did not know.

ROSACEAE. Rose Family.

Cercocarpus betuloides Nutt.

Kos-chet'-tsi (Wailaki).—The shrub very familiarly known as mountain mahogany. It grows 6 to 15 feet high, and is very common on dry, brushy hillsides throughout the region. It is easily distinguished by its small, distinctly pinnate-veined leaves, its long, feather-tailed seeds, and the extreme hardness of its wood. The wood was formerly used for arrow tips and furnished the tool used by women in digging "Indian potatoes" and worms out of the ground. For this purpose a straight, pointed stick was used, and this was taken as a badge of the gentler sex. Many of the women now use iron for digging the bulbs. The larger sticks were also used for spears and for war and fighting clubs. One old Indian related a story about a bear fight which he had seen his father, a very powerful man, engage in when he was a boy. His only weapon consisted of a stick of mountain mahogany, about 7 feet long, which had a large knob on one end and a sharpened point at the other. He placed the child in a tree for safety. As the enraged bear made a dash at the Indian, he, jumping skillfully to one side, hit the animal a terrible blow on the legs as it passed. Again and again, as the bear dashed forward, it was struck on the legs until it was nearly disabled, when it was speedily dispatched with the sharp end of the club.

Fragaria californica Cham. & Schlecht.

Pol-put' mäm (Yuki).—The wild strawberry, which is fairly common on wooded hillsides. The berry is much like that from the cultivated plant, but smaller. It is never gathered in quantity, but is eaten, especially by children, direct from the vines.

Rosa californica Cham. & Schlecht.

Käl'-ē (Yuki).—The wild rose which forms a considerable part of the brush fields in damp soils in Round Valley. It has an abundance of semifleshy fruit, but this is very rarely used for food.

Rubus parviflorus velutinus (Brewer) Greene.

Wä'-sä (Concow).—The well-known thimbleberry, a thornless, wide-leaved shrub, 3 to 8 feet high, with showy white flowers. It is abundant on brushy hillsides throughout the country. The berry is red and has much the appearance of a raspberry, but is more nearly hemispherical. Further south the berry is rather dry and insipid, but the more abundant rainfall of this region, together with the fogs which frequently cover certain areas, develops a more fleshy and finely flavored berry. It is never gathered in quantity, but is eaten directly from the bush by old and young alike.

Rubus leucodermis Dougl.

Tē-täm' kä-lā' mäm (Yuki).—The wild black raspberry of the region, a wide-spreading shrub with greenish-white, excessively thorny branches, 3 to 5 feet long, and a delicious black, juicy fruit. The fruit, the under side of the leaves, and the young branches are covered with a white powder or bloom which gives the plant its specific name. The Indian name signifies "mountain thorn berry" and is equally descriptive with the above. This is the most important of all the wild berries of this county. The fruits are eaten in the fresh state, and when gathered in considerable quantity are dried or canned for winter use. Special trips are taken into the coast mountains after the berries in July, when they are usually ripe.

Rubus vitifolius Cham. & Schlecht.

Gol-lē' (the g very guttural) (Yuki).—The common blackberry. The black, juicy berries are eaten directly from the vines and are occasionally dried for winter use. The infusion of the root is the most common remedy used for checking diarrhea. The Little Lake name for the vine is *ti-ti-mē'*; the suffix *yem* is added to indicate the root. The Concow name for the vine is *wân-kö-mil'-ē*.

PYRACEAE. Pear Family.

Amelanchier alnifolia Nutt.

No Indian name was obtained for this shrub. It grows 8 to 10 feet high along streams in the hills and is well known as service berry. The black, glaucous berry is somewhat juicy and is used in the fresh state to some extent for food. The wood was sometimes used for arrows.

Crataegus rivularis Nutt.

Ăl-tē''-hez'-mil (Yuki).—The common thorn, a bush or small tree, 10 to 15 feet high, with numerous clusters of small, white, sweet-scented flowers. It is sparingly armed with short, woody thorns, and bears numerous clusters of diminutive, apple-like fruits, which ripen early in the fall. The fruit is so bony that it is used very little for food. The wood is used to some extent for fuel, but care is taken to avoid the thorns, which are considered to be more or less poisonous. *Löm'-kä-lā'* is the Little Lake name for the tree; *hī* is added to designate the wood from it.

Heteromeles arbutifolia (Ait. f.) Roemer.

Mĭl-kö'-chē (Yuki).—The common toyon or Christmas berry of California, an evergreen tree, 10 to 25 feet high, which is characterized by rigid, sharply serrate leaves and large clusters of holly-like fruit.

These ripen very late in the autumn and are much used as a substitute for the true holly for Christmas decoration. They are also quite largely used for food by the Indians. They are occasionally eaten direct from the tree, but they are generally cooked first. This is sometimes done by boiling, but most frequently by roasting a bunch of them over red-hot coals or by tossing them about with hot coals in a basket. The cooking is said to change the disagreeable acid taste to a sweet one, but I had no opportunity, on account of the season, to test the truth of the statement. A decoction of the leaves and bark is used to allay stomach ache and various pains and aches. The Pomo name for the tree is *but''-zä'-zä;* the Yokia, *kī-yī'*.

AMYGDALACEAE. Peach Family.

Cerasus demissa Nutt.

Pō-mä' mäm (Yuki).—The deciduous wild or choke cherry, known by some authors as *Prunus demissa*, which has pendant racemes of large, shining red or black berries, a third to a half inch in diameter. It grows commonly in openings in oak and Oregon spruce forests, and especially in open valleys, throughout the region. The fruit is very astringent while still red, but when black and fully ripe it is quite edible, although rather tart. The tree fruits very abundantly in Round Valley and large quantities of the cherries are consumed either in the fresh or dried state. A few Indians have recently been taught to can the fruit and to make jelly out of it. This is not done on a large scale, however, because so much sugar is required in the process.

The inner bark is gathered in large quantities by some individuals for its medicinal value as a tonic, to check diarrhea, and to relieve nervous excitability. The Yokia name for this cherry is *hō-sä' kä-lā';* the Wailaki, *nin-kōs'-jē*.

Prunus subcordata Benth.

Gos'-i (Concow).—The wild plum, a scraggly deciduous shrub, 3 to 10 feet high, which yields in favorable localities an abundance of delicious red or purple fruit nearly an inch in length. The bush is not very common in this region, nor does the fruit develop well, but it is sometimes gathered for food, and used to be dried in some quantity when long special trips were made for it.

CASSIACEAE. Cassia Family.

Cercis occidentalis Torr.

Chā'-ā (Yuki).—The common redbud of the region, a magnificent wide-branching shrub, 8 to 20 feet high, which is conspicuous in early spring for its wealth of small reddish blossoms and in summer and fall for the beauty of its large, thin, kidney-shaped leaves and its abundance of thin, green and red seed pods. It is very common on brushy hillsides and the margins of valleys throughout the district. Both the bark and the wood from the young sprouts are gathered in the fall and used for the strands of some of the finer baskets. They are used either like thread or merely as woof to twine in and out in the so-called twining baskets. The wood is also used for withes in making up the skeletons of some baskets. Baskets made of redbud are very common and are often very pretty, but they are not so durable as those made from roots, especially those of different species of saw grass or Carex. Considerable ingenuity is exercised in the collection and manipulation of the material to produce a varied result. The branches are sometimes cut down in winter or early spring so as to insure suitable material for use the next fall. The color of the bark is then slightly red, but this is often changed into a darker red by exposing it to smoke, and is blackened in various ways, as by soaking it in dirty water or in water and ashes, or in a decoction of oak bark to which scraps of old iron have been added. The bark is separated by first steaming the wood and then peeling. It is entirely separated when it is to be used as thread, but some of the wood is left adhering to it when the strands are to be used for twining. By so doing the strand appears white on one side of the basket and red on the other. The bark is said to be used by the old settlers as a substitute for quinine in chills and fever. The Little Lake name for the bush is *mū-lā'* and the Yokia name *kä-lā' ä kä-lā'*. The Concow names given are *dop* and *tal'k.*

VICIACEAE. Vetch Family.

Lathyrus watsoni White.

Jou'-lish fal (Yuki).—A stout, scrambling, pea-like vine which has light-green tendril-bearing leaves and showy clusters of brownish yellow flowers. It so completely covers wide areas of level land in Round Valley with its tangled growth that it is very difficult to walk through it. It makes excellent fodder for horses and cattle and is sometimes cut for hay. None of the Round Valley people admitted that they ate the plant, but a Yokia Indian informed me that at the present time it is frequently cooked and eaten for greens when only about 3 inches high. The older plants are sometimes boiled and applied as a poultice to swollen joints. The Yokia name is *kal-kä-tzä'.*

Lupinus carnosulus Greene.

Môl-chū'-lēz (Yuki).—A stout, succulent, annual lupine, 1 to 2 feet high, which has a loose verticillate raceme of showy deep-blue flowers in early spring and grows thickly together in large patches in damp valley land throughout the region. The young roasted leaves were formerly used to some extent for greens. The Little Lake name for this little annual is *koi-ē' kä-lā'*, which signifies "raven tree." I was unable to learn the connection between the two names.

Lupinus luteolus Kellogg.

A plant which is referred rather doubtfully to the above species is one of the most serious weed pests of Round Valley, often completely covering wide areas of bottom land with such a uniform and profuse growth that one is readily led to believe that it was planted as a staple crop. It is a smooth, very stout-stemmed, wide-branching annual, 3 to 5 feet high, with yellow, sessile, verticillate flowers, and silky, two-seeded pods. No Indian name has been applied to the plant and it appears to be an introduced species. The white people know it as "seven-year weed" or "butter weed," the latter name referring to the color of the flowers, the former to the erroneous idea that it appears only every seventh year. Horses eat the tops sparingly in June when they are still succulent, and earlier in the year they are eaten for greens by a few Indians. Care is taken to throw away the first water in which the leaves have been boiled. I was informed by one individual that the seeds were used also for food after they had been pounded into flour and leached like acorn meal, but the statement appears to be somewhat questionable.

Medicago denticulata Willd.

The common bur clover is an introduced annual which has no Indian name. It grows in the grass everywhere and also on gravelly river bars. It is a valuable forage plant, the seeds as well as the leaves affording much nourishment. Sheep often eat the dried seed pods in summer after they have fallen to the ground. Powers records a statement that the Wailakis used to have a dance in spring when the plants became crisp and ready to eat. It seems probable, however, that in Round Valley these Indians now prefer various species of true clover.

Psoralea macrostachya DC.

Hoi'-tā (Concow).—A light-green, woody perennial, 6 to 12 feet high, which has soft, trifoliate leaves and numerous silky, oblong or oblong-oval clusters of rather inconspicuous purple flowers. The plant does not grow in Round Valley, but is rather common along streams and river beds near Ukiah. The inner bark is very strong and fine and was formerly used by the Concow and Yokia tribes for thread. The strong root fibers are still sparingly used in the manufacture of hunting bags and for rope. This fiber was first noticed in the possession of a Concow Indian at Round Valley, who informed me that he obtained it near Ukiah. He called my attention to the pleasant aromatic odor which the fiber had retained for over a year, and from his description and his name I was enabled to collect and fully identify the plant at Ukiah a few weeks later. The Yokia Indians told me of its former use for thread and of its manipulation with a certain bone of the common gray tree squirrel as a substitute for a needle, but the Pomo Indians near by seemed to know nothing of the plant. The root fiber is now very little used, but it was formerly considered superior to the fiber from dogbane on account of its pleasing perfume and white color. The large roots have to be pounded most vigorously before the fibers separate and become flexible. The best-known Indian name for the plant is *mat'-ka*, the Yokia name.

Robinia pseudacacia L.

The ordinary Eastern locust has been cultivated in the Indian reservation for ornament and shade. The Wailaki chief informed me that chickens are fond of the seed and I have noticed horses eating sparingly of the leaves.

Trifolium spp.

Sō (Pomo).—This Pomo name is very nearly the equivalent of the word clover, but inasmuch as it is applied to a few other plants, such as pepper grass (Lepidium), which belong to entirely different groups and orders, it is to be regarded as a broader term, which in general signifies any plant the leaves of which are eaten green and in the uncooked state. Each different kind—sweet, acid, mountain, and tree clover—is designated by a special syllable, used generally as a prefix but occasionally as a suffix. The Yukis do not appear to have one special generic name, but *sik* and *pots* are frequent as suffixes in their names.

Many kinds of clover grow in great profusion in the limy soils of the West, and as a class they are considered excellent forage for all kinds of animals. In other parts of the world some of them have been occasionally eaten for food by man. In Ireland, for example, the dried flowers and seed heads of the common white or Dutch clover have in times of famine been ground into flour and converted into bread, and in the Eastern and Southern States the poorer negro families occasionally eat one or two species with vinegar as a salad. With the Indians of Mendocino County, and especially of Round Valley, however, clover enters into their diet as an essential element even at the present time. The fresh green foliage taken before flowering is the part most generally eaten, but the flowers of three or four species and the seeds of one or two are also used. After flowering the leaves are apt to be tough and bitter. From the beginning of April along into July it is no uncommon sight to see small groups of Indians wallowing in the clover and eating it by handfuls, or to see an Indian squaw emerging from a patch of clover and carrying a red bandanna handkerchief full of the crisp stems. Under the present system of separate and restricted farms the latter method is now usually adopted. At home the clover is often placed out of doors in the grass and carefully shielded from the withering effects of the sun by a blanket. Old and young and even the more civilized Indians of Round Valley tell me that they eat clover and that some of the species, especially the sweet clover and the acid clover, are very good and nutritious food. The facts are certainly unquestionable, but it is presumable that habitual use, and perhaps inherited character, as well as the extended use of condiments, must have some particular effect on the digestibility of the material. According to chemical analysis the leaves contain most of the essential food ingredients.

As in the case of cattle, however, it sometimes causes bloat, which, according to Powers, is relieved in case of the Patwin Indians of the San Francisco Bay region by the internal use of a decoction or extract of soaproot or by rubbing or treading upon the stomach. One case was cited to me where an old squaw died in the middle of a clover patch from the effects of bloating due to the clover which she had eaten. It is quite probable that the Indians have learned to eat other substances along with the clover which aid in the digestion and tend to prevent bloating. Pepper nuts seem to be so used, and nowadays the clover is often dipped into salt water before eating, a practice which formerly was not generally observed. So extensively has the prodigal abundance of clover entered as a factor into the lives of these Indians that it is not only used as a food, but special dances were formerly held to commemorate its appearance in spring. Powers shows also that it enters into the games of some of the tribes.

Trifolium bifidum decipiens Greene.

Sā pots (Yuki).—A small, sparsely-leaved and rather tough-stemmed annual. It is eaten very sparingly and only when quite young. One individual stated that the seeds make good pinole.

Trifolium ciliolatum Benth.

Choi'-ē pots (Yuki, "jaybird clover").—A small, smooth, tough-stemmed annual which grows under trees, and is consequently called *kä-lā' sō* (tree clover) by the Pomo. There is a very considerable difference of opinion in regard to the edible quality of this species. The Yuki, some of the Pomo, and especially the Concow, claim that it is not fit to eat, and one of my best informants in the latter tribe cited a case where a young girl was said to have been poisoned by eating it. One Yokia and one Wailaki informant told me that it was good to eat. Horses are said to eat it with impunity.

Trifolium cyathiferum Lindl.

Mūl′-sic (Yuki).—Another tough-stemmed clover which is very little eaten by the Indians, but greatly relished by stock. It grows among grass, especially in the mountains, and is therefore known as "mountain clover." A woman was observed eating the flowers. The Pomo name is *mä-tas′ sō*.

Trifolium dichotomum Hook. & Arn.

Pä-shō′-lā (Yokia).—A tough-stemmed clover which bears numerous terminal clusters of showy red-purple flowers an inch in length, and has large seeds. It grows most abundantly in open fields near Ukiah. The leaves are sparingly eaten when very young and the seeds are sometimes gathered for pinole.

Trifolium obtusiflorum Hook.

Kā sō lök (Pomo).—A stout, erect clover, 1 to 3 feet high, which grows late in spring and in early summer on well-drained soil, near stream banks in the open country. It has narrow, sharply saw-toothed leaflets and rather large, reddish-purple and white flowers, and is very distinctly characterized by the peculiar sticky exudation which even at midday in June covers the flower heads and growing stems like dew. This exudation has a strong acid taste and on this account the clover is variously known as "sour" or "salt" clover. The name "spring clover," which is sometimes applied to it, was given because it so often grows near springs in the mountains. Notwithstanding the sharp acid taste, it is considered to be one of the very best clovers for green food. It is sometimes eaten just as it is, but the leaves are generally eaten only after the acid exudation has been washed away. Dipping in salt water gives considerable relish to the plant. The Yuki name is *sä-cöm′;* the Numlaki, *jä-gilt′*.

Trifolium variegatum Nutt.

Pē-ni-mē′ (Yuki).—An annual clover, with numerous heart-shaped leaves, small dull-purplish heads of flowers, and slender stems, which form dense tangled growths in damp valley land. It is common throughout the region and is considerably used for green food.

Trifolium virescens Greene.

Sik and *bät* (Yuki).—These two names were given me for a clover which grows in large patches about Ukiah and in Round Valley, especially on the western side. It is readily distinguished by its large succulent stems, ovate leaflets, and large inflated yellow and pink flowers. All parts of the plant are sweet, and on this account it is well known as sweet clover. It is unquestionably the favorite species for eating. The herbage is eaten even when the plant is in flower, and the flowers and seed pods are likewise used for food. The seeds are not separated and made into pinole, but eaten raw. The Pomo name is *bä-hō'*.

Trifolium wormskjoldii Lehm.

Pĕ''-ni-pēn-sik' and *sä-cöm'* (Yuki).—These names were given to me for a robust succulent perennial, a foot or so high, which has ovate leaflets three-fourths of an inch in length and numerous showy heads of purple and white flowers an inch or so long. It grows in tangled masses in damp valley land throughout the region, often occupying wide areas, to the almost total exclusion of other plants. Toward the last of June this is the only species that is gathered and eaten in large quantity. Figure 74 represents a woman leaving one of these large fields with a handkerchief full of the clover. The flowers are eaten as well as the leaves. Two Pomo names were given for the plant, *bē-tä' sō* and *kä sō*.

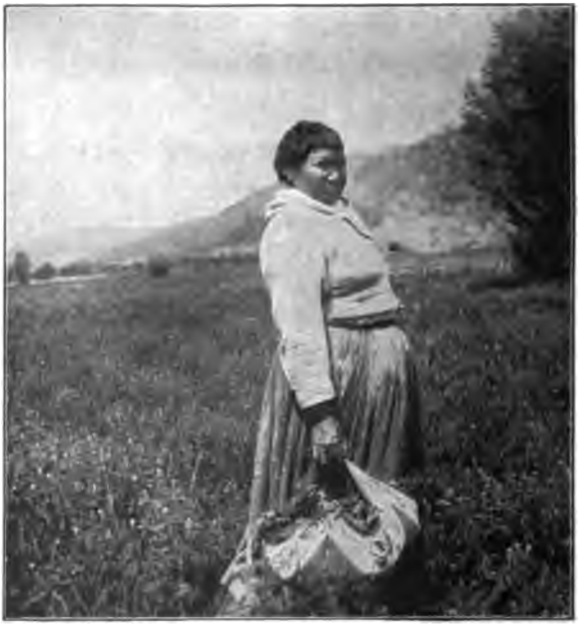
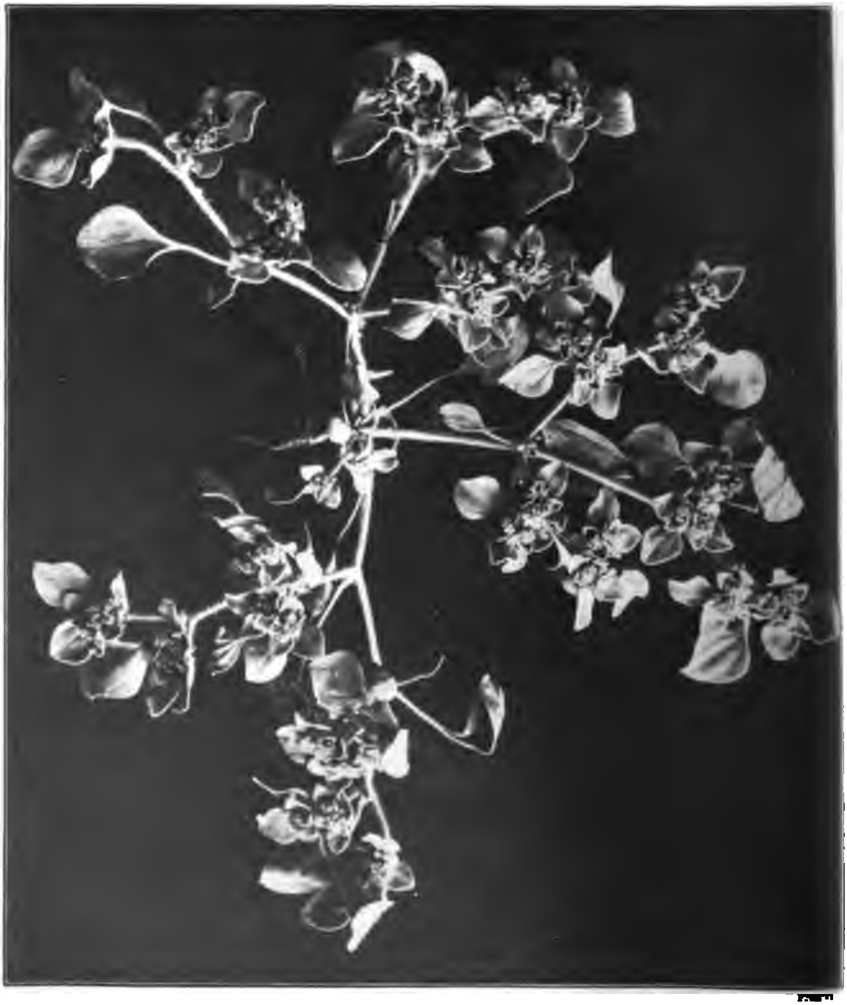


FIG. 74.—Clover eater.

Vicia americana Muhl.

Pod''-jez-pâl-mök' (Yuki).—A weak scrambling or climbing pea-like vine, with thin tendril-bearing leaves and small clusters of bright purple flowers. It is common in grassy fields and in brush throughout the region. It makes very good fodder, and, when young, is often cooked and eaten for greens by various tribes. The



TURKEY MULLEIN (CROTON SETIGERUS).

cooking process formerly consisted, on account of the lack of vessels suitable for boiling, in baking the stems, but since the introduction of tinware they are now more frequently boiled. The Yuki name given above refers to the use of the stout roots in tying. One individual informed me that they were remarkably strong. For some reason or other a small bunch of these roots is said to be kept in the pocket for good luck while gambling. The Little Lake name given for the plant is *shä-wä-kä'*.

EUPHORBIACEAE. **Spurge Family.**

Croton setigerus Hook.

Shä' um (Pomo).—A very low, gray weed (Pl. XIX), native to California, and popularly known as "turkey mullein." Some authors give it the technical name *Eremocarpus setigerus.* It grows abundantly in black adobe soil everywhere throughout the open country from July to November, and is very conspicuous on account of its dainty, mat-like appearance. Its circular outlines are very prettily arranged in flat, leafy rosettes, as shown in the plate. The white, bristly hairs which cover the whole plant in the greatest profusion are very characteristic, each bristle being a part of a compound hair, which radiates outward from the leaf in all directions. Both the flowers and the fruit are inconspicuous. The shining, bean-like seeds, only a sixth of an inch long, are borne in great abundance, and in summer and autumn constitute one of the favorite foods of the wild mourning dove, which flocks to localities where the plant is particularly abundant, a circumstance which the Indians take advantage of in order to kill them in large numbers for food. Turkeys feed on the seed also, and on this account, and on account of the wooly, mullein-like appearance of the leaf, the plant has been called turkey mullein. The Indian name above given signifies "fish soaproot;" for, as the name implies, the bruised leaves are used as a substitute for soaproot in the process of catching fish by stupefying or poisoning them. It is hardly inferior to soaproot for catching fish, but this use has not been known to some of the tribes, especially the Yokia and Pomo, for so long a time, having been taught to them in this instance by more southern tribes. The early Spaniards were well acquainted with the use of this plant, and therefore called it yerba del pescado (the fishing herb). A recent popular name which suggests the intoxicating action of the plant is "fish locoweed." The plant is altogether too commonly used both by the Indians and whites for catching fish. It is used in precisely the same manner as is described under *Chlorogalum pomeridianum.*[1] The exact cause of the stupefying or crazing effect is not known. Some Indians attribute it to the stellate hairs, which, they

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[1] Page 320.

say, attach themselves to the eyes and gills and make them frantic. If these should become thus attached, they would undoubtedly cause great distress, but the chemical qualities of the plant may easily account for the effect. Not only is the odor very strong, but the taste is exceedingly acrid, as it is in most of the members of the spurge family to which it belongs. A cursory examination of the eyes and gills of fish caught by means of the plant would probably settle the question, for the stellate hairs are exceedingly characteristic of the plant.

The Concow are particularly acquainted with the plant, and use it for medicinal purposes as well as for catching fish. The fresh leaves are bruised and applied to the chest as a counterirritant poultice for internal pain; a decoction of the plant, or some of the fresh leaves, is put into warm water which is used as a bath in typhoid and other fevers, and a weak decoction is taken internally as a cure for chills and fever. White people sometimes use it for the latter purpose, but so far as known it has not yet been widely used in such a way. The Yuki name is *kē-chil' wä-ē-mök'*.

ANACARDIACEAE. Sumac Family.

Rhus diversiloba Torr. & Gray.

Ma-tū'-yä''-hō (Pomo).—The shrub commonly known as poison oak, which is common in valleys and on hillsides everywhere throughout the county. It is much less vine-like than the eastern poison ivy, but is equally as poisonous to the touch. The older full-blooded Indians are not readily poisoned by it, and in fact several of them use it for various household purposes, and have even been seen to eat a dozen leaves or more without distress, but the half-breeds are often badly affected by handling it. According to Dr. Hudson, *ma-tū'* means doctor. *Yä* is the Pomo name for south, and *hō* means fire. The bush is therefore the southern fire doctor. Its principal medicinal use is to burn out and remove warts from the hands. The practice is carried out by cutting the wart off to the quick and then applying the juice. I was told that after a few applications the root is totally removed inside of one or two days. It is used in a similar manner to remove ringworms. One Indian, a Wailaki, informed me that if the fresh leaves were quickly bound to the wound made by a rattlesnake the effect of the venom would be counteracted. The fresh leaves were formerly used by the older squaws not only to wrap up acorn meal for the baking process, but, as the late Dr. Charles Mohr informed the writer, from personal observation among the Concows near Marysville, to mix with it. The object was not ascertained. The slender stems are still occasionally used for circular withes in basket making. The fresh juice turns black rapidly on exposure to the air, and is sometimes used on this account to make temporary tattoo marks on the skin. These disappear as soon as the skin is renewed, but the color, as a rule, is very permanent. Some of the purest black strands seen in the Pomo baskets are produced, according to Dr. Hudson, by applying the fresh juice to them.

The fruit, which ripens at Round Valley in June and July, is freely eaten by the common yellowhammer and by squirrels, and hogs are said to fatten upon both the leaves and the fruit.

For remedies in case of poisoning the Indians have commonly been taught to apply saleratus, and possibly the use of soap root as a paste was taught to them by the early settlers, but this appears doubtful. One undoubtedly original cure consists in applying a strong decoction of the root of the sunflower (*Wyethia longicaulis*) to the affected parts.

The Wailaki name for the plant is *kots'-tā*.

Rhus trilobata Nutt.

Bö-bö'-ē (Yokia).—The wild red-fruited sumac, a shrub 2 to 5 feet high, with very aromatic leaves and yellow flowers. It is rather common in open sunny spots around Ukiah, but was not observed in Round Valley.

One of the leading men of the Yokias informed me that seventy or eighty years ago, when smallpox was particularly prevalent in Anderson Valley, and few, if any, white men were around, the fruit, which is rather viscid and acid in taste, was used as a remedy against this disease. The ripe berries were dried and then finely powdered. While the pox were still dry, water was added to the powder, which was then applied as a lotion. When the sores were open and moist, the powder was dusted upon the surface. This is quite probably the smallpox remedy which a Round Valley medicine woman referred to, but said that it did not grow inside the valley.

The wood is used by the Indians' in southern California for making baskets, but it does not appear to be extensively used for such a purpose in Mendocino County.

ACERACEAE. Maple Family.

Acer macrophyllum Pursh.

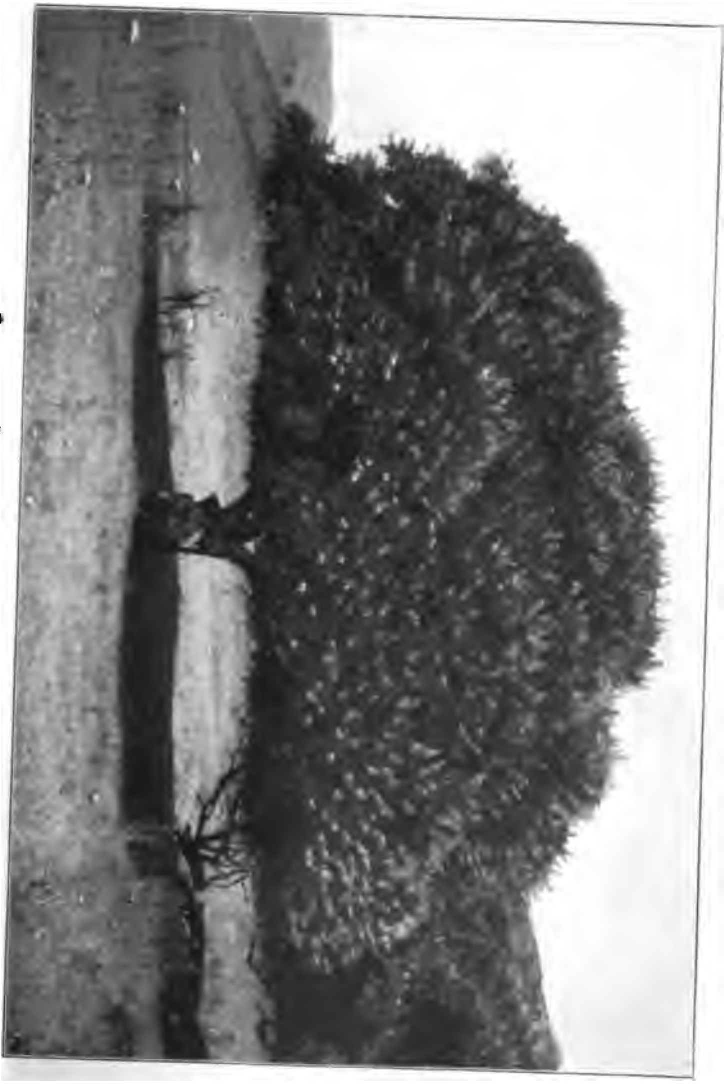
Pal-gön'-shē (Yuki).—The large-leaved maple of the district, a tree 50 to 90 feet high, often 2 to 3 feet in diameter, which bears characteristically large, five-lobed leaves, measuring from 5 to 10 or more inches across. It grows in the valley near streams and in moist situations in the mountains. The inner bark when taken from the tree in springtime "looks very white and new," and is especially valued by the Concow for making baskets. In the fall it is not so desirable. I was told that in former years it constituted the chief material from which this tribe made their baskets. From the bark also they made a crude dress which consisted of a horizontal girdle with broad, vertical streamers.

A very singular use to which the bark is applied in catching deer was made known to me by the chief of the Wailakis, Captain Jim. In the case recited a number of men were engaged for several days in gathering the bark, cutting it into bands about an inch in width and fastening it together as a continuous roll which looked much "like a roll of barbed wire," but was very considerably larger. This band was suspended "like a telegraph wire" on stakes about 4 feet high so that an immense letter V was formed, the apex of which extended out into the valley, while the ends terminated at the mouths of two adjacent canyons. The V line was, therefore, over a mile in length. The space included in the V was selected for the excellence of its pasturage, and especially on account of the fact that deer were known to feed there. After everything was arranged three Indians disguised like animals and armed with brittle sticks, a piece of smoldering oak bark, and a bone dagger resorted to the open end of the inclosure and if any deer were within the V stationed themselves at the end of the lines and in the middle, and then stealthily proceeded on the approach. If a deer came near to the maple band one of the Indians would shake the band and thus frighten it back; if one attempted to pass a man he would break a stick or expose the glowing piece of oak bark; finally, when through sheer fright they were coralled at the apex, the Indians would suddenly jump up and kill them with the bone daggers.

AESCULACEAE. Horse Chestnut Family.

Aesculus californica Nutt.

Dē-sä' kä-lā' (Pomo).—The California buckeye or horse chestnut (Pl. XX), a more or less shrubby tree 10 to 40 feet in height, which bears a great abundance of fragrant clusters of white flowers from May to July, which, in autumn, are partially replaced by large luscious-looking fruits 1 to 2¼ inches in diameter. The 3 to 7 fingered leaves usually drop off the tree a month or two after flowering time and thus expose the fruit, which often hangs on until the beginning of winter. The Pomo translation for their name is "fruit tree." No name could be more appropriate for the particular use of all the Indians, both at Ukiah and Round Valley, for without exception all of the tribes eat the fruit in considerable quantity even at the present time. Some state that when properly cooked it is "awful nice," or that "it is better and healthier than potatoes," and even some of the more well to do and refined state that it is "pretty good." When raw, however, it is commonly regarded as poisonous and recognized by at least one of the tribes near Ukiah as a means of committing suicide. The fruit is undoubtedly poisonous in the fresh state. Two or three



CALIFORNIA BUCKEYE (AESCULUS CALIFORNICA).

methods are used in preparing it for food, but they consist essentially in roasting and then washing out the poison. The buckeyes are placed in a hole lined with rock and willow leaves in which a fire has previously been built, more willow leaves are added and the whole is covered with hot ashes and dirt and allowed to remain from 1 to 8 or 10 hours. The fruit then has the consistency of boiled potatoes, and may be either sliced, placed in a basket, and soaked in running water for from 2 to 4 or 5 days, depending upon the thinness of the slices, or mashed and rubbed up into a paste with water (when the red-brown skin floats and is removed from the surface) and placed to soak from 1 to 10 hours in sand, as in the case of acorns. A wider and deeper hole is used because the water drains off more slowly. After this process the resultant mass, which has the consistency of gravy, is ready for consumption. It is frequently eaten cold and without salt. Buckeyes decay or sprout very rapidly and are therefore not preserved for future use for long periods. After sprouting the taste is said to be disagreeable. The buckeye fruit is also a favorite food for squirrels, but hogs will not eat it. It is claimed that they are very useful for expelling bot worms from the intestines of horses, and that when they are eaten by cows they are very apt to cause abortion.

The leaves or young shoots are probably used to a slight extent by the Yuki and Concow to poison fish, but for this purpose they are inferior even to blue curls (*Trichostema lanceolatum*). Sheep and cattle nibble at the leaves, and cattle, especially, seem to get fat on them. A large cattle owner informed me, however, that cattle when thus fattened lose their flesh with remarkable rapidity when driven over the country to any considerable distance. The bark is apparently the only part of the tree used medicinally. Small fragments are placed in the cavity of a tooth to stop the toothache. One well-authenticated case of the fatal poisoning of goats from eating the bark was recently investigated by the writer. The mistletoe which occasionally grows upon it is said to be used as an abortifacient.

The wood, which is quite soft, was formerly used as twirling sticks in the process of making fire by friction. The Yokia name for the tree is *bä-shā'*, the Yuki, *sympt'-ōl*, and the Numlaki, *făr'-sökt*.

RHAMNACEAE. Buckthorn Family.

Ceanothus cuneatus (Hook.) Nutt.

Yŭk (Yuki).—A low evergreen species of California lilac 6 to 12 feet high, which has small, thick opposite leaves, rigid branchlets, white flowers, and large, three-horned resinous fruit. It forms impassable thickets on the edges of the valleys and on low, dry hillsides. The brush is useful on account of its rigid branches in building fish dams. Deer feed on the leaves and squirrels are fond of the seed, which is produced in great abundance. The white flowers are called *yūk-kuml'* and are probably used for some purpose. The Pomo name is *bä-kām'* and the Wailaki *hit.*

Ceanothus integerrimus Hook. & Arn.

Hē'-bē (Concow).—A blue or white flowered species of the California lilac 5 to 12 feet high, which has long, flexible branches, thin, alternate, ovate leaves, and elongated racemes of flowers followed by three-lobed fruiting capsules. It is common on brushy hillsides, especially in forests of yellow pine and Oregon fir. The Concow squaws gather the young flexible shoots for the circular withes of baskets, and also collect considerable quantities of the seed for pinole. The taste of the bark is somewhat like that of wintergreen, but I could not learn that it was put to any medicinal use, nor could I find that other tribes made use of the shrub. The fruiting capsule, exclusive of the seed, is exceedingly bitter and would probably repay a chemical investigation. The fruit is borne in great abundance.

Rhamnus californica Esch.

Hō-sä' kä-lā' (Yokia).—A bush or small tree 4 to 20 feet high, with thin, herbaceous, narrowly elliptical leaves, small green flowers, and black, berry-like fruit 1/3 to 1/2 an inch in diameter. It grows on rocky hillsides and near streams throughout the region and is well known there, together with *Rhamnus tomentella*, as pigeon berry and pigeon bark. Wild pigeons eat the berries. Elsewhere the shrub is known under the old Spanish name of *cascara sagrada* (sacred bark), and also as coffee berry, the fruit and seeds bearing considerable resemblance to those of coffee. Neither is edible. The flowers are borne in the greatest profusion and attract one's attention in passing, either on account of their delicate perfume or by the hum of bees, flies, and other insects which sip their nectar. The bark is a valuable cathartic and kidney remedy. With some of the Yokia it is regarded as almost a specific for grippe. Their method of preparation and use, which is different from that of other tribes, is as follows: A handful of the bark is thrown into a gallon or so of water and boiled "until it tastes like wine." The bitter taste is said to disappear entirely on long boiling, but the extract, if swallowed, is still nauseating and causes dizziness. It is taken as freely as possible. Three cups is said to have cured a man who had such a bad case of mania that he could be held down only with the greatest difficulty. The Yuki name is *um'-pē* or *tun'-ti;* the Concow, *pö*, and the Wailaki *shast-kēt'-ä.*

Rhamnus purshiana DC.

This species differs from *R. californica* in being usually much taller and more tree-like in habit and in having very much longer leaves, with a coarser and more prominently veined structure and less narrowly elliptical. It is the cascara sagrada of commerce, but not that of the earlier Spanish settlers. One or two trees were pointed out to me in Round Valley, but it does not appear probable that the Indians have learned to distinguish between the two shrubs. It is more abundant farther north in Humboldt County.

Rhamnus ilicifolia Kellogg.

Bä-shöm' (Yokia).—A species of buckthorn, 6 to 15 feet high, which has long and very flexuous branches, small, evergreen holly-like leaves, which are yellowish or rusty beneath, and small semifleshy red berries about a third of an inch long. The fresh inner bark is orange-colored, aromatic, and, although not disagreeable to the taste, very slightly bitter. My Yuki informants told me that it was "good medicine," but were unable to tell me for what purpose it was used. The bush is very common in the hills about Round Valley and on the river bottoms south of Ukiah. The Wailaki name for the bush is *di-kö'-shö.*

VITACEAE. Grape Family.

Vitis californica Benth.

Shē-in' (Pomo).—The native wild grape of the region, which climbs over trees in canyons and in damp places to a height of 30 feet or more. The fruit is purple, about one-third of an inch in diameter, and is borne rather abundantly in large clusters, which ripen in late summer. The berry is full of seeds, and generally very sour; but my Yokia informant, who seemed to be especially well versed in Indian lore, told me that while those vines which grow on laurel and willow trees produce tart fruit, those that grow on the white or black oak produce sweet fruit. As the latter grow in drier and more open situations, the difference, if such exists, must be attributed to this cause. A very good jelly is made out of the fruit by a few of the better educated women. The smaller woody parts of the vine are extremely flexible and are considerably used by the Pomo tribes for the rims of their large cone-shaped carrying baskets. It is gathered at almost any time and soaked in water and hot ashes, after which the bark is removed and the wood split into a couple of strands, which, although very coarse, are used substantially as thread. The Yuki name for the wild grape is *möt-mö' mäm*, the Numlaki *kop.*

LOASACEAE. Loasa Family.

Mentzelia laevicaulis (Dougl.) Torr. & Gr.

Kā-tsak'-ū (Wailaki).—A fine perennial, 2 to 3 feet high, which has a dry hispid surface throughout, a whitish stem, light green leaves 2 to 6 inches long, with wavy saw-toothed margins, and most magnificent yellow flowers, 3 to 4 inches in diameter. The Indian children call the plant "star flower," because it opens only at night; but it well deserves the more elegant and distinguishing name of "blazing star," which has been applied to it more generally. The plants grow singly or in patches on the dry rocky beds of streams throughout the county, blossoming late in summer. The Indian name signifies "sticky plant" and was applied because the leaves, which are densely covered with short barbed hairs, stick to the clothes of passers-by. A decoction of the leaves is used internally to relieve stomach ache and as a wash in some loathsome skin diseases. The Little Lake name is *ek*.

DATISCACEAE. Datisca Family.

Datisca glomerata (Presl) Benth. & Hook.

Hī chä-hä' kä-lā' (Pomo).—A smooth, stout, very leafy perennial, 5 to 7 feet high, which bears very considerable resemblance in the form and arrangement of the leaves to the nettle. It may at once be distinguished from the latter by the absence of stinging hairs. Specimens of this plant were collected near Ukiah, none having been observed at Round Valley. It grows rather sparingly along mountain streams, being more common southward. The name given above signifies "bitter-sick tree." The plant is herbaceous, except that it is slightly woody at the base, but its leaves and roots are most intensely bitter and give the saliva a greenish-yellow tinge. Both parts are used, even at the present time, to procure trout, being manipulated in exactly the same manner as soap root. It is said that water newts and frogs are not affected by the juice when applied in this way, but that trout are killed very quickly. My Yokia informant told me that their name for the plant is *wen*, and that it is a good "fish medicine."

ONAGRACEAE. Evening Primrose Family.

Boisduvalia densiflora (Lindl.) Wats.

Mū-sē'-päl (Pomo).—A widely branching, very leafy annual with numerous small rose-colored flowers in the axils of each leaf. The fruit is a cylindrical capsule about three-fourths of an inch long, which bears numerous tiny gray seeds. The plant is abundant in low, damp soils throughout the county. The seed has a rich nutty flavor, and is largely gathered for pinole and for bread.

Godetia albescens Lindl.

Lēl'-mil (Yuki).—A stout, erect, leafy annual, 1 to 2 feet high, which bears numerous purple flowers about an inch in diameter, in dense spikes on short, leafy branches at the top of the stem. It grows rather commonly in moist bottom land in Round Valley. The seed is borne in great abundance, and is used at the present time for pinole. A decoction of the leaves is said to be an excellent wash for sore eyes. The Pomo name is *bē-mō'*.

ARALIACEAE. Ginseng Family.

Aralia californica Wats.

Gos'-ē-zi sō (Pomo).—An aromatic, perennial herb, 8 to 10 feet high, with compound leaves bearing heart-shaped leaflets 4 to 8 inches long and numerous spherical clusters of small, white flowers. It grows in damp places in deep canyons throughout the county, but is not abundant anywhere. The Pomo name signifies "elk clover," but the best accepted common name is "California spikenard." The sweet aromatic roots were found in several Indian houses, both at Round Valley and at Ukiah, and the growing plant was afterwards pointed out to me at Ukiah by an Indian guide. A decoction of the dried root is highly valued as a medicine, especially for diseases of the lungs and stomach. It is used a great deal for consumption, for colds, and for fevers. The Yuki name given for the plant is *bu-kī'-muk*, the Concow *mâl-ē-mē'*.

APIACEAE. Celery Family.

Angelica sp.

But''-chō'-ä (Pomo and Yokia).—A very aromatic umbelliferous plant, about 2 feet high, with bipinnate leaves and broad, thin ovate leaflets an inch or so long, which are finely and conspicuously net-veined and often lobed near the base. The flat elliptical fruit is about half an inch long by one-third wide. It is abundant on rocky hillsides in the open chaparral at Round Valley. The root is woody and varies greatly in size from one-fourth of an inch up to 1 or 2 inches in diameter.

Angelica root, as it is most commonly called both by the Indians and whites, is a most valued remedy and talisman. It is found in nearly every household and is frequently carried about the person for good luck in gambling or hunting. Those roots found in places where the plant does not generally grow, especially cold places, are the more highly prized. The root, after thorough mastication, is sometimes rubbed on the legs to prevent rattlesnake bites, and it is also tied around the head and ears in bad cases of headache and nightmare. The juice mixed with saliva is used as a remedy for sore eyes. It is chewed and swallowed in cases of cold, colic, and especially fever. For cold and catarrh it is very frequently crushed up and smoked like tobacco. The fresh, young sprouts, being sweet and aromatic, are eaten raw with great relish. The seed, although produced in considerable abundance, does not appear to be used for any purpose whatever. The Yuki name of the plant is *chi-en'*.

Carum kelloggii Gray.

Shä-bō'-tä (Pomo and Yokia).—A smooth, slender, and mildly aromatic perennial about 5 feet high, which grows abundantly along creeks and in open meadows throughout the country, and is well known as "anise." The plant has very sparse foliage above, but the root leaves with their linear leaflets 2 to 4 inches in length are very prominent in May or June, when they are still tender. They have no resemblance to clover, but on account of their sweet taste and since they are greatly relished in the raw state, as clover is, the plant is frequently called "sweet clover," a name which is applied also to *Trifolium virescens*.

The most characteristic feature of anise is its fascicle of strong, slightly fleshy, and hard-fibrous roots, and the peculiar flat ellipsoidal tubers which it bears in varying abundance. Some plants bear only one or two tubers about half an inch long, while others in rich land are said to bear much larger ones in much greater abundance. Together with the semifleshy roots, they form a favorite source of food, being eaten raw, cooked like acorn bread, or used for pinole. The seeds also have a very agreeable aromatic taste and are largely used to flavor other kinds of pinole. The strong outer root fibers, which are rigid and quite hard like bamboo, are on this account made into compact cylindrical brushes an inch or so in diameter, which are used "for combs." It is apparent, therefore, that combing the hair, as well as the use of soap, is not an operation introduced entirely by the white man. The Yuki name of the plant, *mön-sin'*, has special reference to the tubers.

Cicuta spp.

Specimens of the poisonous water hemlocks were looked for in vain both at Round Valley and at Ukiah and no reliable information about them was obtained, but I was informed by an old settler that the plants do grow in Round Valley, and it is well known that some of the species are found in considerable abundance in the adjoining counties. It would be very interesting to learn whether the plant is used for any purpose or is ever mistaken for other plants with fatal results.

Daucus pusillus Michx.

Skut-in'-jet (Wailaki).—A small erect annual ½ to 2 feet high, which has very finely dissected leaves and white flowers and looks very much like the ordinary cultivated carrot, but has no edible fleshy root. It grows in considerable abundance on dry hillsides, but is not used for any other purpose than that of a talisman in gambling. It is said that the Spaniards regard it as a valuable remedy for rattlesnake bite. The Yuki name is *hös''-ä'-sisht*.

Heracleum lanatum Michx.

Mun'-shök (Yuki).—The most robust umbelliferous plant of the region, which has compound leaves with leaflets 4 to 10 inches broad and flower clusters often 10 inches in diameter. It grows 3 to 8 feet high in damp ground among the brush, in valleys or on northern hillsides, and is well known as the "cow parsnip." The tender leaf and flower stalks are sweet and very agreeably aromatic and are, therefore, much sought after for green food in spring and early summer before the flowers have expanded. In eating these, however, the outer skin is rejected. Mr. George Grist who has had an extended experience with the Indians of Round Valley, and who in 1892 was the Government farmer for the reservation, informed me that he had seen the hollow basal portion of the plant used as a substitute for salt. It was dried in short cylinders and eaten either in the dry state with other food or placed in the frying pan and cooked into the substance to be eaten. A strong decoction of the roots is said to have been used by the earlier Spaniards as a lotion for rheumatism. The Yokia name for the plant is *tä-rä-tit'*, and the Concow is *chou'-mē-ō*.

Lomatium utriculatum (Nutt). Coult. & Rose.

Nī'-ē and *kin-göt-gō'-sä* (given as Yuki).—A slender, yellow-flowered plant a foot or so in height, which has very finely dissected leaves and grows in considerable profusion near the schoolhouse in Round Valley, both on the level land and on brushy hillsides. It is also called "clover" or "fir clover" by the Indians, who eat the young leaves raw in May or June when they are still crisp. The Pomo and Yokia name for the plant is *shä-bö'*.

Sanicula menziesii Hook. & Arn.

Sē-ū-didl'-ā (Wailaki).—A yellow-flowered plant 1 to 2½ feet high, which has bristly toothed, palmately lobed leaves and small globular fruit well armed with weak, barbed bristles. It grows in shady places everywhere throughout the district, being a rather disagreeable weed on account of the seed catching in the clothing. The Indian name refers to the fact that the seeds often catch in the hair when one lies down in the shade. The root is supposed to bring good luck in gambling if chewed and rubbed on the body. The seed has a taste very much like that of angelica, but is perhaps more bitter. No medicinal use of the plant was learned.

Sanicula tuberosa Torr.

Kä'-ä bö (Pomo).—A delicate plant 3 to 4 inches high, which has a spherical tuberous root, small, very finely divided leaves, and small, yellow clusters of flowers. It grows in the hills throughout the county. The bulb is only a half inch or so in diameter, but on account of its delicate flavor it is considered one of the very finest of the so-called Indian potatoes. It is generally eaten in the raw condition. The Wailaki name for the plant is *je-mä'-ti.*

ERICACEAE. Heath Family.

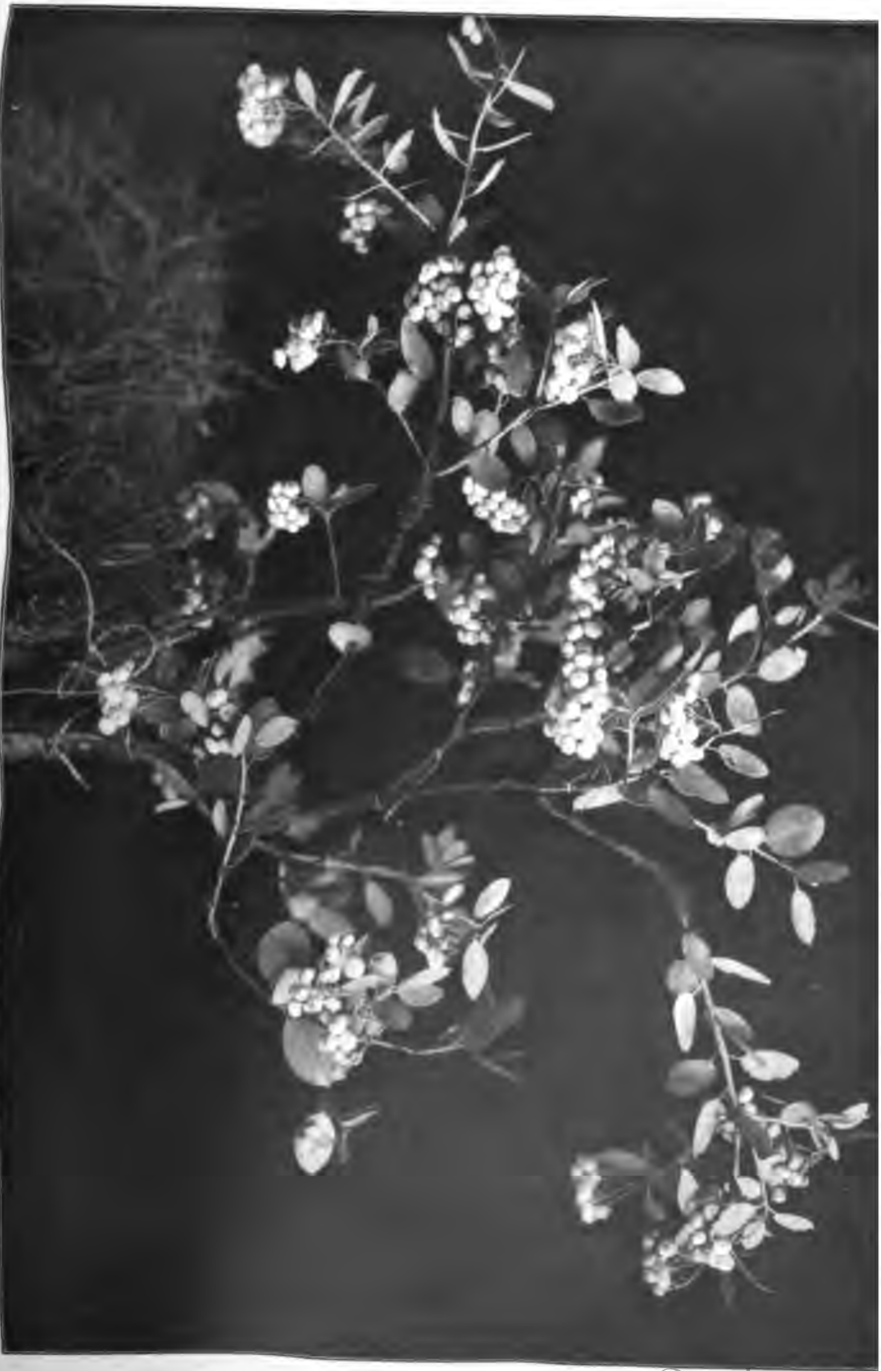
Arbutus menziesii Pursh.

Foin'-kä (Yuki).—The common madroña of the Pacific coast, a superb and stately evergreen tree, 80 to 100 feet in height. It grows very plentifully and adds greatly to the beauty and, as a native shade tree, to the comfort of the Indian villages and towns about Ukiah. It is less common and is apt to be bushy in Round Valley, although some splendid trees are to be found there. A striking character of this tree, which it has in common with the manzanitas, is that about the 1st of July each year a thin layer of the bark exfoliates from the tree in cinnamon-like quills, thus exposing a new surface, which changes in the course of a few weeks from green to a polished light-brown color. As the limbs are almost cylindrical and the new bark is continuous throughout, the tree is thus enabled to retain all of the beauty and symmetry of youth. One Yuki Indian informed me that this exfoliated bark was formerly used as a tea for the relief of stomach ache, but this usage could not be verified.

In February and March the madroña is thickly covered with white, globular, wax-like flowers, which furnish an abundance of wild honey, and late in the fall and until the middle of January the fruit is an abundant and favorite source of food for countless doves and wild pigeons, and for barnyard poultry, especially turkeys.

Concerning the edible qualities of the fruit there seems to be some difference of opinion. Several white people affirmed that it is not deleterious, and that their children are rather fond of it, as it has a sweet taste. The Wailakis, Little Lakes, and Calpellas eat it, but some of the Concows and Yukis claim that it is deleterious and causes vomiting if eaten in any considerable amount. So far as the author is aware, however, no specific case of poisoning has been traced to [illegible] the fruit. None of it is kept by the Indians for winter use, because the berry soon decays when bruised, apparently containing a ferment which produces this result. Deer are very fond of the fruit.

The Little Lakes make an infusion of the leaves for the cure of colds. The wood is fine-grained, and would be very valuable for furniture if it did not check so badly. The Indians use it for lodge poles



MANZANITA (ARCTOSTAPHYLOS MANZANITA).

and make saw handles, stirrups, and various little tools of it. It is valued commercially for the manufacture of charcoal for gunpowder. As a fuel it burns so rapidly and emits so much heat that it should be used along with some slow-burning wood. Cows will eat the leaves when green grass is scarce. Both the leaves and the scarlet berries are highly prized for decorative purposes. *Dis-tā'-tsi* and *kou-wät'-chu* were given to me as the names used by the Concows for the tree; the Little Lake name is *kī'-yā* and the Yokia *kab'-it.*

Arctostaphylos manzanita Parry.

Kö-öch'-ē (Yuki).—The common manzanita (Pl. XXI) of California, a magnificent evergreen shrub, usually 8 to 15 feet high, with highly polished, mahogany-colored branches and berries.

This species of manzanita is an exceedingly common shrub throughout the region, generally occupying wide areas on dry, barren ridges, often to the entire exclusion of other vegetation, and in masses so thick that they are impenetrable to man.

The fruit is not much more than a third of an inch in diameter, but the quantity produced is very large. It was used very extensively by the Indians when the Spanish priests first settled the country, and from the latter it received the name "manzanita," which means "little apple," and was suggested by the shape of the fruit. This name has been universally adopted as the common as well as the botanical specific name of the shrub. The generic name is derived from two Greek words meaning "bear" and "grapes." Bears are exceedingly fond of the fruit, and it is in manzanita patches that they are hunted during the summer and autumn. The ripe fruit is dry, mealy, and very nutritious. Its time of ripening used to be memorialized by the Concows and other tribes by holding a special dance and "big eat." The green fruit is very tart and so indigestible that it is apt to cause colic, but when eaten in small quantity it is of great value in quenching thirst, an item of considerable importance, because the shrubs often grow on dry and barren hillsides. During July and August, when the berries are ripe, a number of squaws go out into the hills with their babies and their huge carrying baskets and beat off large quantities of the berries. These are caught in the baskets and carried home, where they are eaten raw or cooked, converted into cider, or stored away for the winter. During the gathering, which may last for a considerable time, the babies are protected from thirst by wrapping them up in the soft, flexible green leaves of the mountain iris.

The Yokia Indians recognized the fact that the bushes do not all yield equally well, and on this account certain large and prolific bushes, and even large areas, were owned by a family or a tribe, and only after the rightful owner's demand was satisfied could the fruit be picked by others. Tribute was often exacted for permission to gather food materials from such property.

An estimate made by Stephen Powers allows as great a yield of solid nourishment in selected acres of these bushes as in the best acre of wheat ever grown in California, proper allowance being made for the cost of cultivation. They are eaten whole in great quantity, but some tribes, especially the Numlakis, use them as a powder, like pinole, or cooked up in hot ashes and made into bread or mush. Death is said to occur from eating the fruit too freely. The bowels become stopped with great masses of seeds and pulp and death follows, with contraction of the pupils and general tetanic spasms, such as are observed with strychnine poisoning or in the symptoms of cerebrospinal meningitis. Dr. J. W. Hudson, who has had a large practice with the Guidiville (Pomo) Indians near Ukiah and who furnished the above symptoms, states that he has observed at least five fatal cases, in all of which the same effect was noted. One similar fatal case has been reported by Dr. B. C. Bellamy, a former agency physician at Round Valley.

The method of making manzanita cider as practiced by one of the more civilized Concow women is worthy of note, for from personal experience the beverage can be recommended as delicious. The ripe berries, carefully selected to exclude those that are worm-eaten, are scalded for a few minutes, or until the seeds are soft, when the whole is crushed with an ordinary potato masher. To a quart of this pulp an equal quantity of water is added. The mass is then poured immediately over some dry pine needles or straw contained in a shallow sieve basket, and the cider is allowed to drain into a water-tight basket placed beneath, or sometimes it is allowed to stand an hour or so and then strained. After cooling, the cider is ready for use without the addition of sugar. It is delightfully spicy and acid in taste. From some information obtained, it seems probable that some of the Indians not only ferment the cider to obtain vinegar, but also to obtain an alcoholic beverage. The Yuki name for the cider is *kö-öch'ök*. A better quality of cider is said to be made from the pulp alone. The berries are ground up in a "pounding basket" and the seed fragments separated by means of a flat circular basket about a foot in diameter. Some of the ground material is placed upon this, and it is then thrown repeatedly into the air, falling on the mat when it is in an inclined position. The fine flour will cling to the meshes, while the heavier seed parts will roll off on the ground.

The Calpella Indians make a tea of the leaves "to cure severe colds," but they are commonly regarded as "too strong" for internal use. In this connection it is interesting to note that the leaves of a closely related species (*A. glauca* Lindl.) have recently been largely manufactured into an extract for the cure of catarrh of the throat and stomach. The Little Lakes boil the leaves till the extract is yellowish red and then use it as a cleansing wash for the body and head—in the latter case to stop some kinds of headache. The leaves are also used by them and by many white people of the county to check diarrhea. An analysis of the dry leaves made by W. H. Rees, of the University of California, shows that they contain about 8 per cent of tannin.

The old Concow women chew the leaves into a thick cud and place the mass on sores for the healing effect; the younger people grind the leaves up with water before applying. It is also used for sore backs on horses.

The crooked, beautifully polished limbs are much prized by white people for fancy woodwork, and a straight manzanita cane is a valuable rarity. The wood makes an exceedingly fine fuel, but it should be used with other more slowly burning wood, because the heat evolved is so great that the stove is very quickly warped and destroyed.

Two V-shaped branches about a yard in height are used, especially by the Yokias, as a convenient way for carrying a large amount of wood on the back. The forks are so selected that one prong on each is straight. After the wood is piled upon the forks the ends of the straight sticks are grasped with both hands and slung over the back. Dr. Hudson states that he has seen a Pomo Indian easily carry 210 pounds of wood on his back with this contrivance.

Bees gather large quantities of honey from the flowers from January to March, and children are fond of sucking or eating the globular waxy flowers.

The Yokian and Little Lake name for the bush is *kī-yī'*. *Bu-kī'* is added to designate the fruit, and *chō-pä'* for the leaf. *Pä-göt'* is the Numlaki name of the bush.

Arctostaphylos tomentosa (Pursh) Dougl.

Kö-öch'-ē (Yuki).—The same Yuki and the same Numlaki names are used for this species as for the preceding. The Little Lake name is *ki-yam'-pö-ē*, and the Wailaki is *te-nis''-tä'*. This species is not so common as the preceding, but is found in considerable abundance on the west side of Round Valley. It may be distinguished by its somewhat smaller size, the hairiness and lighter grayish-green color of its leaves, and its smaller somewhat puberulent fruit. The uses differ in no way, except that the berry is a little more highly prized for cider. The fruit is smaller, but the edible portion is larger in proportion to the seed.

VACCINIACEAE. Huckleberry Family.

Vaccinium ovatum Pursh.

The Indian name for this shrub was not learned. It is the common evergreen huckleberry of the redwood belt in the coast regions, where it forms dense jungles 3 to 5 feet high on high and bleak ridges. It is a handsome plant, and in this region, where it is daily bathed with fog, it yields large quantities of sweet black berries about the size of a pea. In July and August the Calpella and some of the other Indians travel 20 to 30 miles to gather large quantities of berries, which they consume immediately or make into pies.

PRIMULACEAE. Primrose Family.

Dodecatheon hendersoni Gray.

Hun''-möl'-ish (Yuki).—The common shooting star or mosquito bill. Its flat, succulent radical leaves, and its umbellate clusters of curiously shaped rose-purple flowers make the plant very conspicuous in early spring. The roots and leaves used to be roasted in the ashes and eaten by the Yukis. The flowers are used by women to ornament themselves at dances. The Yokian name of the plant is *kä-däch'-käch''-dō*.

OLEACEAE. Olive Family.

Fraxinus oregana Nutt.

Pök (Yuki).—The Oregon ash is rather common in the low, moist soil of Round Valley, and is valued by the Yukis chiefly for fuel and for making tobacco pipes. It will burn while still green. Straight pipes are made out of a section of limb about a foot long and a couple of inches thick by whittling it down to a small diameter except at the end, which is left intact. The bowl is dug out with a knife or burned out with a red-hot iron, and a red-hot wire is forced through the pith, which, being quite scanty, adapts the wood specially to this purpose. Ash pipes were observed both in the valley and around Ukiah. As the bowl is not at right angles with the stem, but in the same line, it is suitable for use only when the smoker is lying down, the position in which it is actually used. The ash leaf is a favorite food of a little black army worm which has white spots on its back. The worm is consumed in large quantities as food by several of the tribes in Round Valley. The fresh roots of the ash when mashed used to be particularly valued by the Yokias for the cure of wounds received in bear fights. The wood is valuable for canes and for making handles and small tools. The Yokian name is *gä-läm'*.

APOCYNACEAE. Dogbane Family.

Apocynum cannabinum L.

Mä (Yuki).—This is the common Indian hemp (fig. 75), so called from its use for fiber by the Indians, a light green, milky-juiced plant 2 to 4 feet high, with small elliptical leaves and rather inconspicuous green flowers. It grows quite commonly along ditches and in wet soil, sometimes encroaching on gardens where it is difficult to eradicate. The inner bark collected in fall is soft, silky, and exceedingly strong. It was used not so very long ago as almost the sole source of fiber for ropes and nets, also to make garments, and as thread. Ropes and nets are still made from it by a few of the older Indian men. The Concow name is *pö*, the Little Lake *mä-shä'*, and the Yokia *si-lim' mä*.

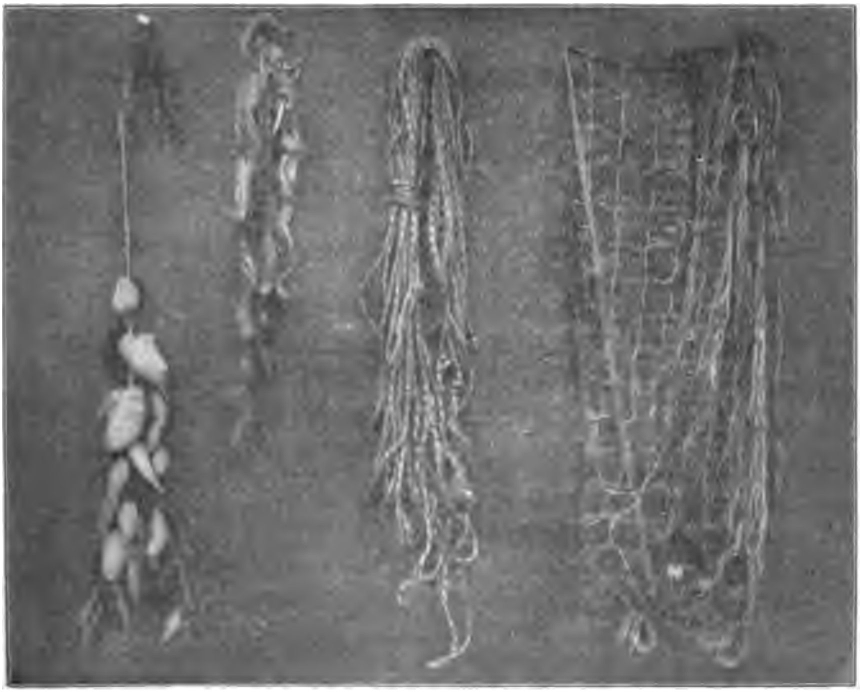


FIG. 75.—Indian hemp (*Apocynum cannabinum*).

ASCLEPIADACEAE. Milkweed Family.

Asclepias eriocarpa Benth.

Mä-chäl' (white *mä*) and *ch'a-ak'* (Yuki).—This common milkweed (fig. 76) is a leafy robust perennial weed 2 to 4 feet high, with conspicuous cream or purplish colored, sweet-scented flowers, a favorite source of nectar for bees. The broadly inflated pod contains a large number of feathery-tailed seeds which are widely distributed by the wind. It grows profusely along roadsides and in low, dry, or wet ground; sometimes, as in valleys, claiming large areas to the extent of from 60 to 90 per cent of the bulk of the vegetation. It is common throughout the interior part of Mendocino County. During the summer and autumn when the grass has been burned up by drought this milkweed is conspicuous, both for its size and for the abundance of its large, soft, flaccid, and hoary-pubescent leaves. These as well as the stems are turgid with a sweet milky juice, in one instance as much as 18 drops having been forced out of a freshly cut stem in a few minutes. A protecting gummy or rubber-like membrane was then formed across the cut. This sticky juice is recognized as an excellent healing lotion for cuts and sores. It is valued to some extent as a means of killing warts, and was formerly used as a convenient lotion to make the pattern of tattoo marks on the skin, and to hold the soot while being pricked into the surface. The juice is irritating to tender-skinned individuals, and is generally recognized as poisonous to sheep, the juicy leaves being especially tempting when these animals are driven over dry valleys in very warm weather. One sheep man asserted that he lost 15 or 20 sheep while driving a flock a distance of about 70 miles. Another individual has been losing sheep near Ukiah from it for the past thirty years. Death is brought about within a half hour after eating. Its poisonous character is so well recognized that sheep men are careful to cut the weeds down before the sheep are driven over places where it is common.

The Yukis make no use of the plant and repudiate it as an undesirable and diabolical importation of the whites; but some other tribes, especially the Concows of the Sacramento Valley, formerly used it for the purposes given above, and also to a greater or less extent as a source of fiber for ropes and string. The use may have been learned from the early Spanish settlers by whom the plant was more widely distributed northward. The Concow name for the weed is *bō̆'-kō* and the Little Lake *gō-tō̆'-lä*.

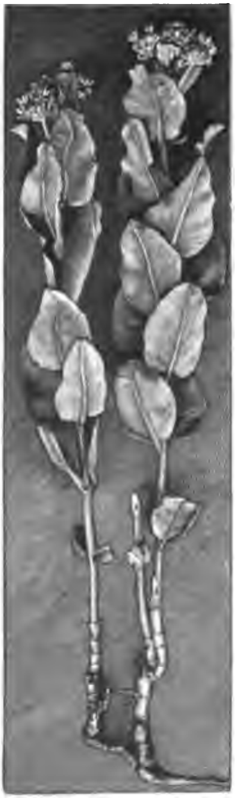


FIG. 76.—Milkweed (*Asclepias eriocarpa*), one-sixth natural size.

Asclepias mexicana Cav.

Chä-wâ'-kot''-sâ (Yokia).—A low, wiry milkweed, which is very common along roadsides in the vicinity of Ukiah. The narrow leaves are arranged about the stem in whorls or fascicles. The showy groups of purple flowers are very attractive to various insects.

In the southern portion of the State this plant is well known to be poisonous to cows and sheep, but about Ukia it has no such reputation. In fact, the Yokia Indians occasionally eat the young blossoms as they do clover. To my surprise, the taste was found to be really pleasant, being rather sweet and somewhat spicy. Eating the flowers is not, however, to be recommended, for the plant belongs to a dangerous

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group of poisonous plants, and the natives probably eat the blossoms only now and then, and perhaps in very small quantity. No further use of the plant was noted.

POLEMONIACEAE. Phlox Family.

Collomia grandiflora Dougl.

Jmi'-lish (Yuki).—The common orange-flowered gilia sometimes called *Gilia grandiflora.* No use was assigned to the plant, nor could the derivation of the word be determined.

Linanthus ciliatus (Benth.) Greene.

Nun-fat'-ē (Yuki).—The common ciliate gilia of California which has also been known as *Gilia ciliata.* It is a low, dry, grayish-green annual, 4 to 10 inches high, with capitate clusters of inconspicuous purple flowers nearly hidden by sharp-pointed bristly bracts. It grows thickly on low, dry, grassy hills, and is exceedingly common throughout Mendocino County, blossoming in the summer. The flowering head was formerly used in the summer by the Yukis as a substitute for coffee. In the winter it is of no value.

The plant is known to the Calpella Indians as *kä-cō-chē-pēl'*, and is used in the form of an infusion as a remedy for coughs and colds in children. Some old Indians keep a cold decoction on hand to drink instead of water in order to purify the blood. I was assured by a white man that it did not taste bad, and that white people also used it for the same medicinal purpose.

HYDROPHYLLACEAE. Waterleaf Family.

Eriodictyon californicum (Hook. & Arn.) Greene.

Til-at'-mil (Yuki).—The well-known yerba santa (holy herb) of California, a dark-green, resinous shrub, 5 to 7 feet high, synonomously called *E. glutinosum.* It grows profusely on dry, bushy hillsides throughout Mendocino County, and is known under the names mountain balm, wild balsam, gum leaves, tar weed, and, although incorrectly, "sumac." No plant is more highly valued as a medicine by all the tribes of Mendocino County. It is found in every household either in the dry state or in whisky extract. It was early adopted by the Spanish missionaries, and recently it has been admitted into the United States pharmacopœia, being of special value in chronic subacute inflammation of the bronchial tubes, and as a means of disguising the taste of quinine. It is conceded to be one of the best medicines recently admitted into regular officinal use. The Indians have various methods of using the plant, and apply it generally in their practice of medicine. The leaf is the only part used. As a cure for colds and for asthma it is considered a specific by the native whites and Indians. It was extensively and very successfully used in Round

Valley in the winter of 1897–98 as a cure for grippe, that disease having been especially prevalent at that time. It is generally valued as a blood purifier, a cure for rheumatism, consumption, and catarrh. As a wash it is used considerably in fevers and for catarrh and consumption. It is also smoked and chewed like tobacco. For the first two diseases the tea is taken freely as a drink for several days. Some drink it either alone or mixed with horehound in place of "store tea," but this is not at all general. Its employment as a substitute for tobacco is not uncommon. When rolled up into wads and dried in the shade the leaves are considered most valuable for chewing. The taste is peculiar, being rather disagreeably resinous and bitter at first. This taste soon disappears and gives place to a sweet and cooling sensation, which is especially noticeable when one ceases to chew for a minute or drinks a glass of water. As one Indian expressed it, "It makes one taste kind of sweety inside." The bitter taste of the extract is obviated by boiling the leaves with sugar.

Sä'-tek (the t explosive) (sticky brush) is the Little Lake name of the plant and *wä-sä-got'-ō* is the Concow name.

BORAGINACEAE. Borage Family.

Amsinckia lycopsoides Lehm.

A rough, hairy annual, with small, bright, orange-colored flowers, the buds of which are arranged in a spiral coil at the extremity of the flowering stem. The fresh, juicy shoots were formerly used for food. No specimens were obtained of the plant, but the species is probably as given.

Cynoglossum grande Dougl.

Shū'-âl (Yuki).—The pretty blue-flowered plant which sends up its broad tongue-like leaves and flowering stalks early in February. It is generally known as hound's tongue and blue buttons, but the Indians call it either "coyote" or "dog ear." In the early spring it is a conspicuous plant in open hillside forests.

The grated roots are used by the Concows to draw out the inflammation from burns and scalds, and by the Potter Valley Indians to relieve stomach ache. The root is also asserted to be of value in venereal diseases. The Yukis claim that the cooked roots are good to eat.

Dē-wish'-ä-mä is the Potter Valley and also the Little Lake name for the plant.

Plagiobothrys campestris Greene.

Kochk (Yuki).—A pretty, white-flowered plant, which grows so profusely in Round Valley that whole acres of ground are made white with its delicately scented forget-me-not-like flowers. On account of its abundance and the similarity in the appearance of large masses to a light fall of snow, the Indian children call the plant snowdrops. The coloring matter at the base of the young leaves is used by women and

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children to stain their cheeks crimson. The crisp, tender shoots and the flowers furnish a rather pleasant, sweet, and aromatic food, and the seeds are gathered in large quantities for pinole. After careful winnowing, the seeds are parched either in an ordinary frying pan or according to the old custom, which consists in tossing them about with hot oak-bark coals. When parched, the taste is much like that of popcorn. The flour, like that from all varieties of pinole seed, is generally mixed with that of barley or wheat, and is eaten in the dry condition, with the addition of a little salt. Alkanin, the dark-red, amorphous dye obtained from *Alkanna tinctoria*, which is cultivated in southern Europe, is, according to some experiments made by Professors Pammel and Norton,[1] nearly identical with the coloring matter of various species of Plagiobothrys and other plants of the Boraginaceae. The yield of color from the plant apparently varies with age. A specimen of *Plagiobothrys ursinus* in the United States National Herbarium, which was collected on June 24, 1894, in the Santa Barbara Mountains of California, had passed its intense purple dye through three thick sheets of specimen paper lying beneath it.

VERBENACEAE. Vervain Family.

Verbena hastata L.

No Indian name was obtained for this plant, which is generally known throughout the United States as blue vervain. It is a tall weed-like perennial with small rugose leaves and a long densely flowered spike of small blue flowers. It grows in the greatest profusion in the swampy bottom lands of Round Valley, and furnishes the Concow Indians, who alone seem to use the plant, with an abundance of small seeds which are used for pinole.

NEPETACEAE. Mint Family.

Marrubium vulgare L.

The common white horehound is well known as a weed along roadsides and in dry neglected fields. It is especially abundant at the old military headquarters in Round Valley, and is there commonly known as "soldier tea." It being an introduced plant, the Indians have but little knowledge of its value. White people use a decoction of the leaves to cure colds, and some of the more educated Indians use it for the same purpose and also to check diarrhea. No Indian names were given for the plant.

Micromeria chamissonis (Benth.) Greene.

Bul-lŭk'-tō (Concow).—The pretty little aromatic herbaceous vine, synonymously called *M. douglasii*, which is so well known to Californians under the Spanish name of *yerba buena* (good herb). It is a thin, opposite-leaved plant with short, weak stems which rest prostrate upon the ground. The plant is much sought for in damp, half-shaded ravines throughout the district. The slender leafy vines are made into rolls and dried for use as a substitute for tea. Occasionally the tea is taken to relieve colic or "to purify the blood." *Mä-stit'* is the Yokia name for the plant.

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[1] Ninth Annual Report of the Missouri Botanical Garden, pp. 149 to 151.

Monardella sheltonii Torr.

Bi-ki'-ki (Concow).—A light green and very aromatic half-woody plant, 1 to 2 feet high, growing, commonly, in small clusters on dry, scantily wooded hillsides. It has opposite leaves and terminal circular clusters of small purple flowers. To some small extent it is known as horsemint and pennyroyal. The aromatic sweet-scented leaves are collected preferably when the plant is in seed, and is much used both in the dry as well as in the fresh state as a substitute for tea, especially by camping parties. The plants growing in Round Valley are considered less desirable than those growing in the Sacramento Valley, because they are more bitter. The tea is also valued in colic and as a blood purifier. The Yokian name for the plant is *pō-lā'-ā*.

Pogogyne parviflora Benth.

Kulk, the l prolonged (Yuki).—A dainty blue-flowered and very aromatic plant, which grows from 5 to 8 inches high and in Round Valley very thickly covers whole acres of overflow land in summer. The seed is gathered in surprisingly large quantities and is highly valued by the Yukis and Numlakis as a sweet aromatic ingredient of wheat and barley pinole. The taste of the leaf when taken before the flowers appear is much like that of some of the finer species of mint, being sharp and devoid of bitter or otherwise disagreeable properties. The Concows use the leaves as a substitute for tea, and, to some extent, as a counterirritant for pains in the stomach and bowels, the fresh leaves being placed in a bruised condition over the abdomen. Many of the Indians place the culled plants in or about their houses to drive away fleas.

Salvia columbariae Benth.

Chū'-pö (Numlaki). A fine grayish green annual about a foot in height which bears a few deeply sculptured leaves of rather coarse texture, and one or two terminal clusters of blue flowers, which are often made more conspicuous by purplish leafy bracts. A remnant of 6 or 7 pounds of the minute gray seeds of this plant was found in the possession of a Numlaki squaw, who had gathered them in Tehema County, in the Sacramento Valley, the previous year and who had valued them highly for making soup, the seeds being very mucilaginous. The species was determined from seeds sent in to the Seed Laboratory of the Division of Botany, Department of Agriculture.

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Scutellaria californica A. Gray.

Lĕl'-mĭl (Yuki).—A low, simple-stemmed plant, with opposite, odorless leaves and large yellowish-white flowers, which grows in large patches on the dry banks of streams.

The leaves were known to a white man who was well versed in Indian lore, as being intensely bitter, and it was thought by him that the Indians use them as a substitute for quinine for chills and fever. This application was, however, disclaimed by all of the Indians consulted. The plant appears to be worthy of an investigation.

Trichostema lanceolatum Gray.

Lēl'-mĭl (Yuki).—The very peculiar little blue-flowered annual, which covers dry grassy hillsides with its ashy-gray verdure throughout the summer months, and exhales a strong pungent odor, somewhat like that of a mixture of vinegar and turpentine. On account of the peculiar shape of the flowers the plant is commonly called blue curls, but it is also known as "vinegar weed" and "tarweed," the latter name being applied to it on account of its sticky exudation, which is so troublesome when it gets on the clothing of persons passing through fields where it is abundant.

This plant is best known as a fish poison, its use for this purpose being especially well known to the Concow and Numlaki Indians, who formerly inhabited the Sacramento Valley. These tribes mash up the fresh plants with rocks and throw this product, without any additional ingredient, into pools or sluggish streams. The fish are quickly intoxicated and float to the surface, when they are easily caught by hand or scooped out of the water with shallow sieve baskets made of small wands of willow. More often, however, other ingredients, such as soap root or turkey mullein leaves, are added. These two plants are considered to be much more poisonous than the blue curls, but the latter is preferred to the fresh leaves and fruit of the buckeye, which are occasionally used for the same purpose.

The Concows also especially value an infusion of the leaves as a head wash for the cure of feverish headaches. In summer the extract is prepared by simply soaking the leaves in cold water; warm water is used in winter. Mixed with a decoction of the leaves of the turkey mullein, the extract of the leaves is valued to some extent as a wash in cases of typhoid fever. The Wailaki name for the plant is *dots-chăng'-she-bog-i*.

SOLANACEAE. Potato Family.

Datura stramonium L.

Several specimens of the common Jimson weed were observed in the streets of Covelo, and it was seen more plentifully around Ukiah, but no Indian name could be obtained for the plant and no use was assigned to it. The first plants grown in Round Valley were imported in 1884 by a white man who made a salve with the leaves which was used for curing the sores on horses caused by the friction of the harness. There appears to be little danger of the plant spreading so as to become an objectionable weed, because the climatic and other conditions are unfavorable.

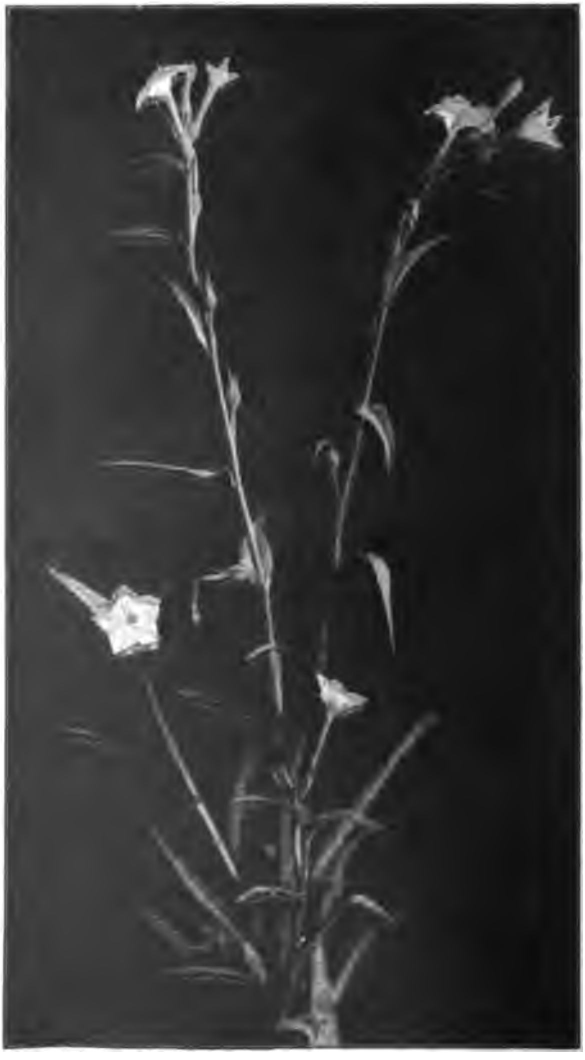

FIG. 77.—Tobacco (*Nicotiana bigelovii.*)

Nicotiana bigelovii Watson.

Sä-kä' (Yokia).—A very viscid and ill-smelling species of tobacco (fig. 77) which is native to California and grows quite commonly along the dry beds of streams near Ukiah. The leaves, the larger of which are from 4 to 6 inches long, are considerably prized for smoking and to some extent for chewing by all of the Indians of the county. The Round Valley Indians gather them in large quantity during the summer when they are engaged in hop picking near Ukiah and in the Sacramento Valley. The leaves are light green, and brittle when dry. The pipe used in smoking this tobacco is that described under *Fraxinus oregana.*[1]

Solanum nigrum L.

Mon'-uk (Numlaki).—The common black nightshade (fig. 78), which occurs somewhat plentifully as a garden weed throughout the district. The berries are used for food, but only when fully ripe. The green fruit is looked upon as poisonous, one case being cited by Mr. C. M. Brown, of Covelo, where in 1893 a white child was seriously but not fatally poisoned by eating the berries, some of which were supposed to have been unripe. The prominent symptoms were vomiting and spasms.

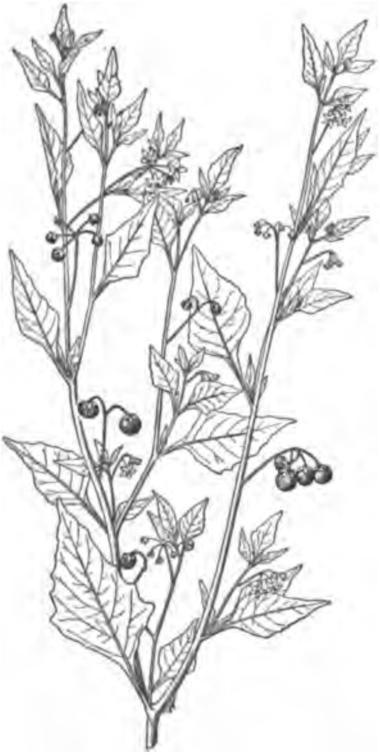

FIG. 78.—Black nightshade (*Solanum nigrum*), one-third natural size.

SCHROPHULARIACEAE. Figwort Family.

Mimulus guttatus DC.

Wä-chä' (the accented *a* being prolonged) (Wailaki).—A succulent, very showy yellow-flowered plant, which grows abundantly in water courses and especially on level land near springs. The plant is used to some extent as a substitute for lettuce, both by the Indians and the white settlers. On two separate occasions I was informed that a long time ago the ash from the leaves was used by the Round Valley Indians as one of the sources of salt. For notes on another plant, the leaves of which were used in the same way, see *Petasites palmata.*[2]

Orthocarpus lithospermoides Benth.

Je-tsa'-chit (Wailaki).—A herbaceous yellow or pink flowered plant about a foot high, the upper flowering half of which is a simple, dense, cylindrical spike, like a painter's brush. The name "paint brush" has been given to the plant on this account. The Indian children call it "coyote tail." It is a common plant on grassy hillsides and moist meadows, but is of no particular use to the natives. It is eaten, sparingly perhaps, by horses.

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[1] Above, p. 378.

[2] Below, p. 395.

Pedicularis densiflora Benth.

Wä-i-mök' (Yuki).--A beautiful, low, herbaceous plant with finely dissected leaves and a densely clustered spike of red flowers. It may be found in open hillside forests in early spring. Children are fond of sucking the honey from the flowers. The Yuki name for the plant is the same as their name for the bird known as the yellowhammer, because the flowers are sought after by these birds for the nectar which they contain. The Wailaki name for the plant is *sel-sàs'-chŏ*, and the Yokia, *stū-stū'-lä*.

Verbascum thapsus L.

The woolly mullein, so commonly introduced into the eastern United States, has become a garden weed in Mendocino County and other parts of California. As is usual in the case of introduced plants, the Indians have no name for it. It has no particular value to them other than to adulterate tobacco, a use which has been taught them by some of the poor white settlers.

PLANTAGINACEAE. Plantain Family.

Plantago lanceolata L.

The English plantain completely covers large areas of meadow land in Round Valley. The Indians have no common name for it and the only use assigned to the plant is that of fodder. It is eaten sparingly by cattle.

VIBURNACEAE. Honeysuckle Family.

Lonicera interrupta Benth.

Hī-wät' (Yuki).—The somewhat erect bushy species of honeysuckle which is found on brushy hillsides throughout the eastern part of the county. Children are fond of sucking the nectar from the long yellow flowers. The long flexible stems are used to a slight extent for the circular withes in baskets, and a concentrated tea is sometimes made from the leaves and used as a wash for sore eyes.

Sambucus glauca Nutt.

Kē-wē' mäm—kē-wē', elder; *mäm*, berry (Yuki).—The common pale elder of California. In the vicinity of Ukiah it frequently attains the dignity of a small tree, but in Round Valley it is seldom more than a shrub. It is very abundant, almost a weed, in level land, in grain fields, and along fences in both localities, having been spread, apparently through the agency of birds that feed freely on the ripe berries. The berries formerly were eaten raw and dried for winter use, yet they were not consumed so extensively as they now are, because of their high acidity. Since the advent of the white man the more civilized Indians have learned to add sugar and make pies out of them; also to preserve them in cans, and even to make jelly of them. They are pronounced to be "awful nice to eat."

Nearly every household is provided with a quantity of dried elderberry blossoms which are used medicinally for several purposes. A decoction is used externally as a lotion for sprains and bruises, and in fevers; also as an antiseptic wash for the itch, and for open sores in domestic animals. It is used internally by the Little Lake Indians to stop bleeding from the lungs in consumption, and is particularly valued by the Potter Valley and Yokia Indians to allay stomach troubles. A decoction of the leaves is used to a less extent as an antiseptic wash. The inner bark is a strong emetic, but is seldom used.

The wood contains a large quantity of pith, which was formerly used as an easily combustible material for starting a fire by means of a knife and a piece of flint. The soft wood was also used to some extent as a twirling stick in the process of making fire by friction. After the pith is removed the wood is used in making syringes or "squirt guns," for whistles, occasionally for flutes, and very commonly as the material of an instrument used at dances for making a clapping sound. This consists simply of two half cylinders of the wood which are fastened together at one end. It is used by striking the free ends against the leg or in the palm of the hand. Other woods, especially the Chinese bamboo, are used for the same purpose.

In folklore, the bush figures with some of the Concow Indians as a cure for warts. These people do not treat the wart with the juice of the poison oak, according to the custom of some other tribes, but merely cut the wart and hold the hand or a finger for some time on the ground at the base of the bush. It is looked upon as a perfect cure.

The different parts of the elder are used so extensively that it was an easy matter to secure a considerable number of Indian names for it. Among the Wailakis the tree is known as *chin-sök'*, the Concows call it *nō-kōm-hē-in'-ē*, the Yokias *bä-tē'* (*kä-lā'*, tree), the Calpellas, Potter Valleys, and Little Lakes *kit-tā'* (*bu-kī'*, berry). The last-named tribe also call the berries *ga-lū' bu-kī'*.

Symphoricarpos racemosus Michx.

Bu-kwâl' (Yokia and Little Lake of Round Valley).—The slender, branched shrub commonly called snowberry, which grows in great abundance on level land throughout the county. The common name is given to the plant on account of the white waxy berries which remain on the shrub throughout the greater part of the winter. The shrub is especially prized for its wood, which, while very light on account of the large quantity of pith which it contains, is yet very strong and durable. The slenderest twigs are bound together and used by the Yokias as a broom for sweeping; the medium-sized branches make first-rate arrows, and less than a century ago they were, according to Dr. Hudson, of Ukiah, used for pipestems. This was at a time when the use of stone pipe bowls was more universal than at present. The Pomo name of the plant is *sä-kä' hī*, the first two syllables of which constitute the particular name for the wild tobacco (*Nicotiana bigelovii*) of the region. *Hī* may be translated roughly as "the wood for." The English equivalent for the word may be taken simply as "tobacco wood." The branches which are a trifle larger are, on account of the appropriate diameter of the pith and the firmness of the wood, especially valued for making the revolving shafts of the drill commonly used by the Indians of this region for making their shell money. The Yuki name for the plant is *âl-lôn-gō'-bl*, the significance of which could not be determined.

CUCURBITACEAE. Cucumber Family.

Micrampelis marah (S. Wats.) Greene.

Zhâl-zhoï'-ē (Yuki).—A long, trailing, or high-climbing vine, commonly called "big root," which is rather common along streams and on open northward slopes throughout the county. It is sometimes known among botanists as *Megarrhiza marah* S. Wats. As the common name indicates, the characteristic feature of the plant is its root, which is spherical and fleshy, often a foot or more in diameter. On account of its resemblance in size and shape to a man's head, it is not infrequently called "man root." The leaves are palmately lobed and are from 3 to 6 inches wide by a little over one-half as long. The long racemes of white bell-shaped flowers are for the most part sterile, but a few develop into fleshy, oblong-oval, and weak-spiny fruits 3 inches or more in length, and these contain several orbicular, nut-like seeds an inch or so in length by about a half-inch in thickness. In form they resemble the seed from which strychnine is derived. They are nearly as bitter, but in addition they are exceedingly acrid. The root is also very bitter and acrid. Both are poisonous when taken internally, and are, according to one informant, used by some Indians for the purpose of suicide. It is worth noting in this connection that Wilkes in his United States Exploring Expedition states[1] that a decoction of the root or seeds of a species (indeterminable) of the same genus called wild cucumber is used by Indian medicine men to poison aged people when they become sick and decrepit. The root was formerly used in the way described under *Chlorogalum pomeridianum*[1] to poison fish which were used for food after being properly prepared. In the domestic practice of medicine both the seeds and the root are very highly valued as a specific against rheumatism and venereal diseases. In practice the fresh root is sometimes rubbed over the rheumatic joints or on the boils and swellings, but it is considered better to roast it in ashes, mash it up well with the hands, and then apply the pasty mass to the skin till it draws blisters. It is claimed that this method is comparatively painless and that it is very effective. The seeds are applied externally in the same manner and are also eaten after they have been roasted until they have become badly charred. For the cure of a certain complaint of the urinary organs, two seeds are eaten in the morning and two in the evening before meals. The Calpella name given for the plant is *mä be-hā' yem;* the Yokia, *he'-tē.*

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[1] Vol. 4, p. 362. 1845.

Mr. J. G. Cooper in the Pacific Railroad Reports[2] states that the root of a certain species (unnamed) of Micrampelis is said to have strong cathartic properties, and that that of a California species has been used to make a well-known brand of "bitters."

CICHORIACEAE. Chicory Family.

Scorzonella maxima Bioletti.

No Indian name was given for this plant, and it has no common name. It is a perennial, 2 to 4 feet high, with a fleshy and very milky-juiced root; has broad, lanceolate root and stem leaves 8 to 12 inches long, with entire margins, and bears several solitary, long-stemmed heads of large, nodding yellow flowers. The plant is very common in wet bottom land in Round Valley. The root is rather bitter, but was formerly used to a small extent for food. The milky juice is converted into a gummy substance after a few hours exposure to the sun, and in this state it is occasionally used by school children as a substitute for chewing gum. The bitter taste which is first experienced is said to be transient.

CARDUACEAE. Thistle Family.

Achillea millefolium L.

Nun-ält'-mil (Yuki).—The common weed known everywhere as yarrow. A tea is made of the leaves and flowers, which is considerably prized in the treatment of consumption, for stomach ache and headache, and as a lotion for sore eyes. An alcoholic extract is applied externally for sprains and bruises.

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[1] Page 320.

[2] Vol. 12, pt. 2, p. 61. 1860.

Achyrachaena mollis Scheuer.

Ch'ō'-mel (Yuki).—A small annual 4 to 14 inches high, which is densely covered throughout with fine soft hair and has large cylindrical clusters of inconspicuous flowers which gradually develop by the expansion of the feathery pappus into very conspicuous and pretty globular seed clusters. The plant grows in great profusion in low ground throughout the county. The seed is only a quarter of an inch or so in length, is very hard and sharp, like an awl, and is moreover very abundantly supplied with a chaffy pappus, yet in May and June it is gathered in large quantities even at the present time for pinole. The pappus is either rubbed off between the palms of the hands or knocked off by tossing the seeds about with rocks and afterwards winnowing in a shallow basket, or by combining this process with that of roasting by tossing the seeds about with glowing coals. It is then generally mixed with buttercup seeds, which ripen at about the same time, and the whole is ground into a fine meal for pinole. The Yokia name for the plant is *yē-hō'*, and the Pomo, *chē-bä'*.

Anthemis cotula L.

Pō'-muk (Yuki).—The common dog fennel or mayweed, an ill-smelling annual, about a foot in height, with finely dissected leaves and numerous white flowers. The Numlaki Indians call the plant *yē-mā-dos'-il-slū*, which means "trail weed." It was evidently introduced into Round Valley at an early date, for it is now a troublesome garden weed. The Yuki name given above has reference to the acrid effect of the herbage upon the eye, for the juice is exceedingly irritating to the skin. After playing with the dog fennel, children very frequently suffer from the poison for several hours. On this account the plant is known to some of the Indians by the name of fireweed or fire grass.

Notwithstanding this acrid quality, the juice is occasionally used as an eye wash, but it is too harsh to be recommended for such a purpose. The fresh plants are sometimes placed in bath water, which is then used as a wash both for severe colds and for rheumatism. White residents make an ointment by frying the older blossoms with lard, and this is used for sore throat and to some extent for rheumatism.

Artemisia heterophylla Nutt.

Komp'-lū''-li (Pomo).—A slender aromatic plant, generally known as wormwood. It grows 3 to 5 feet high, and has soft lance-shaped leaves, which are woolly beneath and of irregular outline, and it bears loose terminal panicles of inconspicuous flowers. The taste of the leaf is exceedingly bitter, but the odor is most agreeably aromatic. It is very common in rich land throughout the entire district, being especially common in valleys. No native plant is more highly esteemed for its medicinal value. A decoction of the leaves is considered by both Indians and whites as a specific for colic and for colds. Its efficiency in the cure of bronchitis is recognized by one of its common names, bronchitis plant. A decoction is used internally by the Indians for stomach ache, headache, diarrhea, and some kinds of fever. Externally it is used as a head wash to relieve headache and as a wash for sore eyes. The juice is reputed by one individual to be a specific against the effect of poison oak (*Rhus diversiloba*). Bruised leaves are frequently placed in the nostril to relieve the effects of a cold, and are tied in bundles around the body to cure rheumatism, and after childbirth to promote the circulation of blood. In the sweat-bath cure for rheumatism the leaves are considered invaluable. The method of treatment consists essentially in binding the dampened leaves in large bundles to the limb and then subjecting it to heat. The heat is sometimes applied by piling heated dirt upon the bandage or by wrapping the limb or even the whole body in a blanket and lying down in a hole which has previously been heated by a small fire. It requires many hours to obtain the desired relief.

The Yokia name for the plant is *kä'-blū*.

Baccharis consanguinea Greene.

No Indian name was obtained for this plant, which is sometimes known as groundsel tree. It is a compact, glutinous evergreen shrub 8 to 12 feet high, with thick, alternate, ovate, stemless leaves with coarsely toothed margins, and terminal clusters of small cylindrical white flowers. The staminate and pistillate flowers grow on separate shrubs, and the latter are very showy in autumn. It grows in various habitats and is common throughout the region. The wood being light, pithy, and very straight, was formerly used for arrows.

Blepharipappus platyglossus (Fisch. & Mey.) Greene.

Hö'-pē (Yuki).—A very showy wide-branching annual about a foot in height, which is more or less hairy and glandular, and has numerous bright-yellow flowers tipped with white. It covers meadows in great profusion, and is known under cultivation as "tidy tips" and yellow daisy. The seeds furnish one of the very highly esteemed kinds of pinole. The Yokia name for the plant is *chē-dä'*.

Coleosanthus californicus (A. Gray) Kuntze.

No Indian name was given for the plant, and it has no common name which is in general use. It is a perennial, 2 or 3 feet high, woody at base, and somewhat scurfy and glandular throughout. The alternate leaves are ovate or heart-shaped and coarse-toothed, those on the main stem being a couple of inches long, while those on the side branches of the terminal or subterminal flower clusters are only a half inch in length. The green, cylindrical flowers are arranged in nearly sessile spikes at or near the top of the plant. It grows commonly on dry gravelly river bottoms throughout the region, being more abundant southward. The leaves are used by the Sanel Indians south of Ukiah as a substitute for tea.

Grindelia sp.

Shē-nâ'-tik (Pomo).—A perennial species of rosinweed 2 to 3 feet high which has alternate lance-shaped, half woody leaves with entire margins, and 3 or 4 terminal resinous heads of yellow flowers about an inch in diameter. The leaves have a rather agreeable taste, very much like that of ordinary store tea, but perhaps a little more bitter. The plant was found only in one locality, on the southern rim of Round Valley. A decoction of the whole plant is valued as a blood purifier, to open the bowels, and to cure cold and colic, especially in children. The leaves are chewed in the fresh state, and are also used as a substitute for tea.

Helenium puberulum DC.

Kä-pä' shō'-pä (Pomo).—A dark-green herbaceous perennial 2 to 4 feet high. The broad, lanceolate, sessile leaves at the base of the plant are 4 to 6 inches long, while the upper measure only 1 to 2 inches. Both are sessile, and their margins are continuous with the stem for several inches. The reddish brown flower clusters are a half inch in diameter, and are borne singly in smooth spherical clusters at the ends of the long, slender branches near the top of the plant. It is of rather frequent occurrence along shady streams throughout the county. Specimens were shown only to the Indians near Ukiah.

The flower heads are extremely acrid and bitter, the taste being compared by one Indian to that of "Wizard Oil." He remarked at the same time that they were hot as red pepper, and stronger than whisky. As a medicine for a certain venereal complaint it is claimed to be almost a specific. The heads and also the leaves are either eaten raw or taken as a decoction. Three plants are boiled in a gallon of water, and three tablespoonfuls of this extract are taken before each meal for two or three days or until a cure is effected. The Yokia name of the plant *kot-kā-yā'-chdō* means "beaver flower," and was probably applied on account of the fancied resemblance of the winged stems to a beaver's tail.

Hemizonia luzulaefolia DC.

Mä-kō' (Pomo).—The commonest and most prolific representative of the various plants, which, on account of their disagreeable exudation, are known as "tarweeds." It is a wide-branching, herbaceous plant, 8 to 20 inches high, with linear, floccose-woolly and viscid, glandular leaves and showy white flowers. It often covers wide areas of dry open ground, and may be found in bloom at any time from April until November. The plant bears a great abundance of ovate, obscurely triangular seeds, about ⅛ of an inch in length, which constitute one of the most important sources of pinole. The seed is slightly bitter, but has a delightfully spicy odor when roasted. It is gathered in the fall, and a small supply is frequently saved over winter and spring. The Yokia name for the plant is *gä-lä'*.

Madia densifolia Greene.

Dos-sil' (Pomo).—An erect, soft-hairy, but only slightly glandular species of tarweed, 2 to 4 feet high, the leaves of which are alternate and linear, on the basal portion of the stem set thickly together, but at the top small and scattering. The heads of flowers, which open in the evening, measure an inch or more in diameter and are yellow with a red center. The plant is very common in open valleys throughout the county. The seed, which is yielded in great abundance, is slightly flattened, curved, and club-shaped, being about ¼ of an inch long, and is prettily marked with microscopic longitudinal striae. It is even more agreeably aromatic than the seed of the preceding species.

Madia dissitiflora Torr. & Gr.

Un'-gā-mil (Yuki).—One of the most typical tarweeds, 2 to 3 feet high, leafy and very viscid throughout, and bearing numerous small scattering heads of inconspicuous flowers. The tarry exudation of the easily detachable flower bracts does much damage to clothing and to sheep's wool. The rich oily seeds are used to a considerable extent for pinole. The Pomo names for the plant are *dä-shā'* and *shä-mut'*.

From the seed of a closely related but more common species, *M. sativa*, an oil has been manufactured in small quantity which was used at one time for cooking purposes.

Matricaria discoidea DC.

Mä'-nä (Yokia).—A plant which looks much like dog fennel, but is easily distinguished therefrom by the sweet odor of its herbage, and the absence of white rays in the flower heads. It is very common throughout the county. A decoction of the leaves and flowers is used by the Yokia Indians to check diarrhea.

Petasites palmata Gray.

Mul'-cōm (Yuki).—A robust perennial 2 to 4 feet high with stout creeping rootstocks from which the long-stemmed, orbicular, and palmately lobed leaves ascend directly. These are deeply 5 to 11 cleft, are incisely toothed on the margin, and often measure 7 to 10 inches in diameter. The flower stalks appear much earlier than the leaves and bear racemose clusters of dull white, sweet-scented flowers. The plant is very common along rivers and large streams in damp woodlands throughout the mountainous part of the country, and may be known as the palmate-leaf sweet coltsfoot. So far as history is concerned, this plant might very appropriately be called the Yuki salt plant. Hedged in from the sea by enemies, this tribe, together with the Wailakis, formerly used the ashes of various plants, but more especially of this one, for the salt which they contain, and being essentially a herbivorous people, salt was as prime a necessity for them as it is for cows and other herbivorous animals. I was told that frequent battles were fought for the possession of a certain salt supply on Stony Creek in Colusa County. To obtain the ash the stem and leaves were first rolled up into balls while still green, and after being carefully dried they were placed on top of a very small fire on a rock and burned. It was a very acceptable ingredient for their pinole, but no kind of salt is or ever was used in their acorn bread or soup. The Indians about Ukiah have never used this plant for such a purpose because the sea has always been more accessible to them, but its use for salt is also known to some of the Little Lake people, who call it *be-dä''-shä-tel'*. The young stems and leaves are used for food by the Concow, who call the plant *tä-tä-tē'* or *mâl-ē-mē'*. The root, which they call *pē'-wē*, is valued medicinally in the first stages of consumption and for grippe; when dry, and coarsely grated like nutmeg, it is applied to boils and running sores to dry them up. The Wailaki name for the plant is *tel-dink'-ō*.

Wyethia longicaulis Gray.

Bish'-nŏn (Yuki).—The most common short-stemmed sunflower of the mountainous part of the county, a perennial plant 2 feet in height, with a profuse tuft of broad lanceolate leaves 12 to 18 inches long, and a half dozen or more sparingly leafy flower stalks which bear one or several heads of flowers 2 to 4 inches in diameter. All parts of the plant, especially the root, are pervaded with a balsamic oil, which is warmly aromatic in flavor and taste. The plant often completely covers whole acres of valley land in Round Valley, and is common everywhere in grassy openings in forests. The lower part of the fresh young leaves and the stem, taken before flowering time, is eaten for food in the field and occasionally at home, and the seed is very much used, along with parched wheat, for pinole.

The large resinous woody root is most highly esteemed as medicine, being used chiefly in the form of a decoction as an emetic. In some stomach complaints it is taken repeatedly, with copious amounts of hot water, until finally a thick yellowish fluid is vomited. The patient then goes to bed to recuperate. As a cure for rheumatism the roots are baked in hot ashes and applied in the form of a poultice; and when dried, powdered, and again moistened they are used as a poultice for running sores and burns. The decoction is also used as a wash to relieve headache and to allay inflammation in sore eyes.

The Wailaki name for the plant is *chä-lä'*, the Little Lake *chi-läm'*, and the Yokia *de-wish'-ä-lum''*.

CLASSIFIED LIST OF ECONOMIC PLANTS.

- I. Food:
  - 1. Foods proper—
    - a. Farinaceous—
      - Seeds—
        - Achyrachaena mollis.
        - Amaranthus retroflexus.
        - Avena fatua.
        - Blepharipappus platyglossus.
        - Boisduvalia densiflora.
        - Bromus marginatus.
        - Bursa bursa-pastoris.
        - Calandrinia elegans.
        - Carum kelloggii.
        - Ceanothus integerrima.
        - Elymus triticoides.
        - Godetia albescens.
        - Hemizonia luzulaefolia.
        - Hordeum murinum.
        - Hordeum vulgare.
        - Lolium temulentum.
        - Lupinus luteolus.
        - Madia densifolia.
        - Madia dissitiflora.
        - Madia sativa.
        - Nymphaea polysepala.
        - Plagiobothrys campestris.
        - Pogogyne parviflora.
        - Polygonum aviculare.
        - Ranunculus eisenii.
        - Rumex crispus.
        - Salvia columbariae.
        - Thysanocarpus elegans.
        - Trifolium bifidum decipiens.
        - Trifolium dichotomum.
        - Verbena hastata.
        - Wyethia longicaulis.
      - Nuts—
        - Aesculus californica.
        - Castanopsis chrysophylla.
        - Corylus californica.
        - Pinus lambertiana.
        - Pinus sabiniana.
        - Quercus californica.
        - Quercus chrysolepis.
        - Quercus densiflora.
        - Quercus douglasii.
        - Quercus dumosa revoluta.
        - Quercus garryana.
        - Quercus lobata.
        - Tumion californicum.
        - Umbellularia californica.

- I. Food—Continued.
  - 1. Foods proper—Continued.
    - a. Farinaceous—Continued.
      - Starchy roots—
        - Cynoglossum grande.
        - Pteridium aquilinum.
        - Scorzonella maxima.
        - Typha latifolia.
      - Tubers—
        - Carum kelloggii.
        - Sagittaria latifolia.
        - Sanicula tuberosa.
      - Bulbs—
        - Allium bolanderi.
        - Allium unifolium.
        - Calochortus maweanus.
        - Calochortus pulchellus.
        - Calochortus venustus.
        - Dichelostemma capitatum.
        - Dodecatheon hendersoni.
        - Hesperoscordum lacteum.
        - Hookera coronaria.
        - Quamasia leichtlinii.
        - Triteleia laxa.
        - Triteleia peduncularis.
    - b. Saccharine—
      - Sweet flowers—
        - Arctostaphylos manzanita.
        - Arctostaphylos tomentosa.
        - Asclepias mexicana.
        - Lonicera interrupta.
        - Pedicularis densiflora.
      - Exudates—
        - Pinus lambertiana.
    - c. Herbaceous—
      - Pot herbs—
        - Brassica campestris.
        - Chenopodium album.
        - Chlorogalum pomeridianum.
        - Claytonia perfoliata.
        - Dodecatheon hendersoni.
        - Lathyrus watsoni.
        - Lupinus carnosulus.
        - Lupinus luteolus.
        - Rumex crispus.
        - Vicia americana.
      - Raw herbs—
        - Amsinckia lycopsoides.
        - Angelica sp.
        - Carum kelloggii.

I. Food—Continued.
- 1. Foods proper—Continued.
  - c. Herbaceous—Continued.
    - Raw herbs—Continued.
      - Claytonia perfoliata.
      - Eriogonum latifolium.
      - Heracleum lanatum.
      - Lomatium utriculatum.
      - Mimulus guttatus.
      - Petasites palmata.
      - Plagiobothrys campestris.
      - Trifolium spp.
      - Wyethia longicaulis.
  - d. Fleshy fruits—
    - Berries—
      - Amelanchier alnifolia.
      - Fragaria californica.
      - Ribes californicum.
      - Ribes divaricatum.
      - Rubus leucodermis.
      - Rubus parviflorus velutinus.
      - Rubus vitifolius.
      - Sambucus glauca.
      - Solanum nigrum.
      - Vaccinium ovatum.
      - Vitis californica.
      - Taxus brevifolia.
    - Other fruits—
      - Arbutus menziesii.
      - Cerasus demissa.
      - Crataegus rivularis.
      - Heteromeles arbutifolia.
      - Prunus subcordata.
      - Umbellularia californica.
  - e. Dry fruits—
    - Arctostaphylos manzanita.
    - Arctostaphylos tomentosa.
    - Juniperus californica.
    - Rosa californica.
  - f. Condiments—
    - Carum kelloggii.
    - Heracleum lanatum.
    - Libocedrus decurrens.
    - Lomatium utriculatum.
    - Mimulus guttatus.
    - Petasites palmata.
    - Pogogyne parviflora.
    - Porphyra laciniata.
    - Roripa nasturtium.
    - Tumion californicum.
    - Umbellularia californica.

I. Food—Continued.
- 1. Foods proper—Continued.
  - g. Miscellaneous—
    - Lichens and seaweeds—
      - Alectoria fremontii.
      - Porphyra laciniata.
    - Fungi—
      - Agaricus campestris.
      - Boletus sp.
      - Polyporus sp.
    - Gum—
      - Pinus ponderosa.
      - Pinus sabiniana.
      - Scorzonella maxima.
- 2. Drinks—
  - a. Simple aqueous drinks—
    - Coleosanthus californicus.
    - Eriodictyon californicum.
    - Grindelia sp.
    - Hordeum vulgare.
    - Linanthus ciliatus.
    - Micromeria chamissonis.
    - Monardella sheltonii.
    - Pogogyne parviflora.
    - Pseudotsuga mucronata.
    - Quercus sp.
    - Umbellularia californica.
  - b. Acid drinks—
    - Arctostaphylos manzanita.
    - Arctostaphylos tomentosa.
  - c. Fermented drinks—
    - Arctostaphylos manzanita.
    - Arctostaphylos tomentosa.
- 3. Forage and fodder—
  - Aesculus californica.
  - Agrostis asperifolia.
  - Carex vicaria.
  - Elymus triticoides.
  - Equisetum variegatum.
  - Hookera coronaria.
  - Hordeum gussoneanum.
  - Juncus effusus.
  - Lathyrus watsoni.
  - Lupinus luteolus.
  - Medicago denticulata.
  - Medicago lupulina.
  - Orthocarpus lithospermoides.
  - Plantago lanceolata.
  - Pteridium aquilinum
  - Quamasia leichtlinii.
  - Quercus californica and other evergreen species.
  - Sitanion elymoides.

- I. Food—Continued.
  - 3. Forage and fodder—Continued.
    - Robinia pseudacacia.
    - Trifolium spp.
    - Vicia americana.
- II. Clothing:
  - 1. Protection and use—
    - a. Hats—
      - Adiantum pedatum.
      - Carex sp.
    - b. Dresses—
      - Acer macrophyllum.
      - Apocynum cannabinum.
      - Iris douglasiana.
      - Salix lasiolepis.
    - c. Thread—
      - Psoralea macrostachya.
  - 2. Ornament—
    - a. Personal ornament—
      - Adiantum emarginatum.
      - Dodecatheon hendersoni.
      - Gymnogramma triangularis.
    - b. Dyes—
      - Alnus rhombifolia.
      - Plagiobothrys campestris.
    - c. Tattooing—
      - Asclepias eriocarpa.
      - Chlorogalum pomeridianum.
      - Pinus sabiniana.
      - Poaceae.
      - Rhus diversiloba.
      - Tumion californicum.
- III. House and furnishings:
  - 1. House building—
    - a. House frames—
      - Arbutus menziesii.
      - Pinus ponderosa.
      - Pseudotsuga mucronata.
      - Sequoia sempervirens.
    - b. House coverings—
      - Pinus ponderosa.
      - Pseudotsuga mucronata.
      - Salix lasiolepis.
      - Sequoia sempervirens.
  - 2. House furniture—
    - a. Beds—
      - Stuffing material—
        - Alsia abietina.
        - Chlorogalum pomeridianum.
        - Evernia vulpina.
        - Typha latifolia.
        - Usnea lacunosa.
- III. House and furnishings—Continued.
  - 2. House furniture—Continued.
    - b. Domestic utensils—
      - Food utensils (baskets, etc.)—
        - Acer macrophyllum.
        - Adiantum pedatum.
        - Butneria occidentalis.
        - Carex spp.
        - Ceanothus integerrimus.
        - Cercis occidentalis.
        - Cercocarpus betuloides.
        - Chlorogalum pomeridianum.
        - Corylus californica.
        - Gymnogramma triangularis.
        - Juncus effusus.
        - Libocedrus decurrens.
        - Lonicera interrupta.
        - Pseudotsuga mucronata.
        - Pteridium aquilinum.
        - Rhus diversiloba.
        - Rhus trilobata.
        - Salix argyrophylla.
        - Scirpus sp.
        - Smilax californica.
        - Tumion californicum.
        - Vitis californica.
      - Water holders—
        - Carex spp.
        - Cercis occidentalis.
      - Washing—
        - Chlorogalum pomeridianum.
      - Child-rearing utensils—
        - Alsia abietina.
        - Corylus californica.
        - Iris douglasiana.
        - Juncus effusus.
        - Philadelphus gordonianus.
      - Miscellaneous—
        - Carum kelloggii.
        - Pteridium aquilinum.
        - Symphoricarpos racemosus.
- IV. Heating, cooking, and lighting:
  - 1. Matches, fire sticks—
    - Sambucus glauca.
  - 2. Tinder—
    - Soft wood—
      - Aesculus californica.
      - Alnus rhombifolia.

- IV. Heating, cooking, etc.—Continued.
  - 2. Tinder—Continued.
    - Leaves—
      - Poaceae.
      - Quercus.
    - Pith—
      - Sambucus glauca.
  - 3. Fuel—
    - Wood—
      - Arbutus menziesii.
      - Arctostaphylos manzanita.
      - Crataegus rivularis.
      - Fraxinus oregana.
      - Pinus ponderosa.
      - Pinus sabiniana.
      - Populus fremontii.
      - Pseudotsuga mucronata.
      - Quercus.
    - Bark—
      - Quercus.
  - 4. Fire receptacles—
    - Pseudotsuga mucronata.
- V. Manufacture:
  - 1. General tools—
    - Arbutus menziesii.
    - Fraxinus oregana.
    - Quercus
  - 2. Special tools—
    - Equisetum variegatum.
    - Juncus effusus.
    - Sambucus glauca.
    - Symphoricarpos racemosus.
- VI. Field industries:
  - 1. Hunting—
    - a. Killing—
      - Arrows—
        - Alnus rhombifolia.
        - Amelanchier alnifolia.
        - Baccharis consanguinea.
        - Butneria occidentalis.
        - Philadelphus gordonianus.
        - Salix argyrophylla.
        - Symphoricarpos racemosus.
      - Bows—
        - Libocedrus decurrens.
        - Philadelphus gordonianus.
        - Taxus brevifolius.
      - Miscellaneous—
        - Angelica sp.

- VI. Field industries—Continued.
  - 1. Hunting—Continued.
    - a. Killing—Continued.
      - Miscellaneous—Continued.
        - Chlorogalum pomeridianum.
        - Cercocarpus betuloides.
        - Pinus sabiniana.
        - Psoralea macrostachya.
    - b. Trapping—
      - Acer macrophyllum.
      - Apocynum cannabinum.
      - Asclepias eriocarpa.
      - Iris douglasiana.
      - Psoralea macrostachya.
  - 2. Fishing—
    - Apparatus—
      - Alnus rhombifolia.
      - Apocynum cannabinum.
      - Asclepias eriocarpa.
      - Ceanothus cuneatus.
      - Corylus californica.
      - Iris douglasiana.
      - Juncus effusus.
      - Pseudotsuga mucronata.
      - Psoralea macrostachya.
      - Salix argyrophylla.
    - Poisons—
      - Aesculus californica.
      - Chlorogalum pomeridianum.
      - Croton setigerus.
      - Datisca glomerata.
      - Micrampelis marah.
      - Trichostema lanceolatum.
  - 3. Harvesting—
    - Cercis occidentalis.
    - Cercocarpus betuloides.
    - Juncus effusus.
    - Pinus sabiniana.
    - Pteridium aquilinum.
    - Salix argyrophylla.
    - Vitis californica.
- VII. Travel and transportation:
  - 1. Boats, Sequoia sempervirens.
  - 2. Packing utensils—
    - a. Pack baskets—
      - Cercis occidentalis.
      - Pteridium aquilinum.
      - Vitis californica.
    - b. Fastening cords—
      - Apocynum cannabinum.
      - Asclepias eriocarpa.
      - Iris douglasiana.

VII. Travel and transportation—Cont'd.
  2. Packing utensils—Continued.
    b. Fastening cords—Continued.
      Juncus effusus.
      Psoralea macrostachya.
      Vicia americana.
    c. Miscellaneous—
      Arctostaphylos manzanita.
      Salix lasiolepis.

VIII. Language communication:
  Ink, Quercus lobata.

IX. War:
  1. Killing—
    a. Bows—
      Libocedrus decurrens.
      Philadelphus gordonianus.
      Taxus brevifolia.
    b. Arrows—
      Shafts—
        Alnus rhombifolia.
        Amelanchier alnifolia.
        Baccharis consanguinea.
        Butneria occidentalis.
        Philadelphus gordonianus.
        Salix argyrophylla.
        Symphoricarpos racemosus.
      Tips—
        Cercocarpus betuloides.
        Quercus.
      Fastening feathers—
        Chlorogalum pomeridianum.
        Pinus sabiniana.
    c. Clubs and spears—
      Cercocarpus betuloides.
  2. War dress—
      Pinus sabiniana.

X. Amusement:
  1. Outdoor games, Pinus sabiniana.
  2. Indoor games—
    a. Gambling—
      Delphinium nudicaule.
      Poaceae.
    b. Talisman in gambling—
      Angelica sp.
      Daucus pusillus.
      Sanicula menziesii.
      Vicia americana.

XI. Ceremonial and religion:
  1. Music—
    Pinus sabiniana.
    Salix.
    Sambucus glauca.
  2. Dancing—
    Arctostaphylos manzanita.
    Arctostaphylos tomentosa.
    Dodecatheon hendersoni.
    Medicago denticulata.
    Quercus.
    Salix lasiolepis.
    Trifolium.

XII. Medicinal plants:
  1. Muscles—
    Artemisia heterophylla.
    Chlorogalum pomeridianum.
    Eriodictyon californicum.
    Heracleum lanatum.
    Micrampelis marah.
    Pinus sabiniana.
    Polypodium californicum.
    Pseudotsuga mucronata.
    Umbellularia californica.
    Wyethia longicaulis.
    Zygadenus venenosus.
  2. Nerves—
    Achillea millefolium.
    Angelica sp.
    Arctostaphylos manzanita.
    Artemisia heterophylla.
    Cerasus demissa.
    Eriogonum latifolium.
    Limodorum giganteum.
    Thalictrum polycarpum.
    Trichostema lanceolatum.
    Umbellularia californica.
    Wyethia longicaulis.
  3. Brain—
    Delphinium nudicaule.
    Limodorum giganteum.
    Nicotiana bigelovii.
    Rhamnus californica.
    Trillium sessile giganteum.
  4. Organs of special sense—
    Achillea millefolium.
    Angelica sp.
    Anthemis cotula.
    Artemisia heterophylla.
    Equisetum variegatum?
    Eriogonum latifolium.
    Godetia albescens.
    Lonicera interrupta.
    Phoradendron flavescens.
    Polypodium californicum.

XII. Medicinal plants—Continued.

4. Organs of special sense—Continued.
   - Quercus lobata.
   - Wyethia longicaulis.

5. Respiration—
   - Achillea millefolium.
   - Alnus rhombifolia.
   - Angelica sp.
   - Anthemis cotula.
   - Aralia californica.
   - Arbutus menziesii.
   - Arctostaphylos manzanita.
   - Artemisia heterophylla.
   - Berberis repens.
   - Clematis ligusticifolia.
   - Eriodictyon californicum.
   - Grindelia sp.
   - Linanthus ciliatus.
   - Marrubium vulgare.
   - Petasites palmata.
   - Pinus sabiniana.
   - Rhamnus californica.
   - Sambucus glauca.
   - Tellima affinis.

6. Circulation—
   - Alnus rhombifolia.
   - Artemisia heterophylla.
   - Berberis repens.
   - Daucus pusillus.
   - Eriodictyon californicum.

7. Surface of body—
   - Achillea millefolium.
   - Alnus rhombifolia.
   - Anthemis cotula.
   - Arctostaphylos manzanita.
   - Artemisia heterophylla.
   - Asclepias eriocarpa.
   - Chlorogalum pomeridianum.
   - Croton setigerus.
   - Cynoglossum grande.
   - Datura stramonium.
   - Erythronium giganteum.
   - Evernia vulpina.
   - Fraxinus oregana.
   - Humulus lupulus.
   - Lathyrus watsoni.
   - Lycoperdon sp.
   - Mentzelia laevicaulis.
   - Micrampelis marah.
   - Petasites palmata.
   - Pinus ponderosa.
   - Pinus sabiniana.
   - Pogogyne parviflora.
   - Polypodium californicum.

XII. Medicinal plants—Continued.

7. Surface of body—Continued.
   - Populus fremontii.
   - Rhus diversiloba.
   - Rhus trilobata.
   - Sambucus glauca.
   - Trillium sessile giganteum.
   - Umbellularia californicum.
   - Wyethia longicaulis.
   - Zygadenus venenosus.

8. Digestive system—
   - Achillea millefolium.
   - Aesculus californica.
   - Alnus rhombifolia.
   - Angelica sp.
   - Aralia californica.
   - Arbutus menziesii.
   - Arctostaphylos manzanita.
   - Artemisia heterophylla.
   - Asarum caudatum.
   - Berberis repens.
   - Cerasus demissa.
   - Chenopodium album.
   - Chlorogalum pomeridianum.
   - Eriodictyon californicum.
   - Eriogonum latifolium.
   - Grindelia sp.
   - Heteromeles arbutifolia.
   - Libocedrus decurrens.
   - Marrubium vulgare.
   - Matricaria discoides.
   - Mentzelia laevicaulis.
   - Micromeria chamissonis.
   - Monardella sheltonii.
   - Pinus lambertiana.
   - Pogogyne parviflora.
   - Polygonum aviculare.
   - Quercus lobata.
   - Razoumofskya occidentalis.
   - Rhamnus californica.
   - Rhamnus purshiana.
   - Rubus vitifolius.
   - Salix lasiolepis.
   - Sambucus glauca.
   - Tellima affinis.
   - Thysanocarpus elegans.
   - Umbellularia californica.

9. Tissue change—
   - Angelica sp.
   - Aralia californica.
   - Artemisia heterophylla.
   - Cerasus demissa.
   - Cercis occidentalis.
   - Croton setigerus.

XII. Medicinal plants—Continued.
  9. Tissue change—Continued.
    Grindelia sp.
    Linanthus ciliatus.
    Micromeria chamissonis.
    Monardella sheltonii.
    Salix lasiolepis.
    Scutellaria californica.
  10. Excretion—
    Alnus rhombifolia.
    Chlorogalum pomeridianum.
    Micrampelis marah.
    Pteridium aquilinum.
    Rhamnus californica.
    Salix lasiolepis.
  11. Generative system:
    Alnus rhombifolia.
    Claviceps purpurea.
    Cynoglossum grande.
    Eriogonum latifolium.
    Helenium puberulum.
    Phoradendron flavescens.
    Pseudotsuga mucronata.
  12. Incantation—
    Angelica sp.
    Equisetum variegatum.
    Erythronium giganteum.
    Lycoperdon sp.
    Sambucus glauca.
  13. Use unknown—
    Gymnogramma triangularis.
    Rhamnus ilicifolia.
    Therofon elatum.

XIII. Poisonous plants:
  1. Fish poisons—
    Aesculus californica.
    Chlorogalum pomeridianum.
    Croton setigerus.
    Datisca glomerata.
    Micrampelis marah.
    Trichostema lanceolatum.
  2. Stock poisons—
    Asclepias eriocarpa.
    Asclepias mexicana.
    Delphinium hesperium.
    Hordeum gussoneanum. } Stock killers.
    Hordeum murinum. } Stock killers.
    Phoradendron flavescens. } Stock killers.
    Sitanion elymoides.

XIII. Poisonous plants—Continued.
  2. Stock poisons—Continued.
    Pteridium aquilinum.
    Quercus.
  3. Human poisons—
    a. Skin (external)—
      Anthemis cotula.
      Asclepias eriocarpa.
      Crataegus rivularis.
      Rhus diversiloba.
      Trichostema lanceolatum.
      Umbellularia californica.
    b. Internal—
      Aesculus californica.
      Agaricus campestris.
      Allium unifolium.
      Amanita muscaria.
      Arcstostaphylos manzanita.
      Arcstostaphylos tomentosa.
      Boletus sp.
      Lolium temulentum.
      Micrampelis marah.
      Phoradendron flavescens.
      Quercus chrysolepis.
      Solanum nigrum.
      Taxus brevifolia.
      Thalictrum polycarpum.
      Trifolium ciliolatum.
      Trillium sessile giganteum.
      Zygadenus venenosus.
  4. Insect repellents—
    Pogogyne parviflora.
    Umbellularia californica.

XIV. Art:
  1. Painting, Evernia vulpina.
  2. Dyeing—
    Alnus rhombifolia.
    Quercus spp.
    Rhus diversiloba Gray.
  3. Tattooing—
    Asclepias eriocarpa.
    Chlorogalum pomeridianum.
    Pinus sabiniana.
    Poaceae.
    Rhus diversiloba.
    Tumion californicum.
  4. Adhesives—
    Chlorogalum pomeridianum.
    Pinus ponderosa.
  5. Miscellaneous, Carex spp.

GLOSSARY OF INDIAN NAMES IN SCIENTIFIC EQUIVALENTS.

Âl-bō′-tē (Y.[1]), Eriogonum latifolium.
Âl-lòn-gō′-bl (Y.), Symphoricarpos racemosus.
Äl-tē″-hēz′-mil (Y.), Ribes divaricatum.
Äl-tē″-hēz′-mil (Y.), Crataegus rivularis.
Äm (P.), Chlorogalum pomeridianum.
Ānt-pot′ (Y.), Hookera coronaria.
Ānt-pot′ (Y.), Triteleia laxa.
Bä-chō′ (P.), Scirpus lacustris occidentalis.
Bā-he′ (P.), Umbellularia californica. (Nut.)
Bā-hem′ (P.), Umbellularia californica. (Tree.)
Bä-hō′ (P.), Trifolium virescens.
Bä-käm′ (P.), Ceanothus cuneatus.
Bal-lō′ kī (P.), Oat Valley.
Bäm kä-lā′ (P.), Salix argyrophylla.
Bā-ō″-zhe-lä′-dit (W.), Thysanocarpus elegans.
Bä-shā′ (Yo.), Aesculus californica.
Bä-shöm′ (Yo.), Rhamnus ilicifolia.
Bä-tē′ (Yo.), Sambucus glauca. (Berry.)
Bä-tē′ kä-lā′ (Yo.), Sambucus glauca. (Tree.)
Bât (Y.), Trifolium virescens.
Bā-töm′ (Yo.), Calochortus venustus.
Bät′-sōm (P.), Quercus dumosa revoluta.
Bät′-sōm dä′-nō (P.), San Hedrin Mountain.
Bē-bi′ (LL.), Pteridium aquilinum.
Bē-cha′-te-chū (W.), Trillium sessile giganteum.
Be-dä″-shä-tel′ (LL.), Petasites palmata.
Be-he′ (P.), Salix lasiolepis.
Bē-mō′ (P.), Godetia albescens.
Bē-shā′ bö (Yo.), Calochortus pulchellus. ("Deer potato.")
Bē-tä′ sō (P.), Trifolium wormskjoldii.
Bi-ki′-ki (Co.), Monardella sheltonii.
Bis (C.), Pteridium aquilinum.
Bish′-nön (Y.), Wyethia longicaulis.
Bi-tē′ (P.), Quamasia leichtlinii.
Bö. (Bulb.)
Bö-bö′-ē (Yo.), Rhus trilobata.
Bok (N.), Umbellularia californica.
Bō′-kō (Co.), Asclepias eriocarpa.
Bö lä (Y.), Dichelostemma capitatum.
Bö lä (Y.), Triteleia laxa.
Bö tē (LL.), Fritillaria mutica.
Bu-kī′ (Yo.), (LL.) (Berry.)
Bu-ki′ muk (Y.), Aralia californica.
Bu-kwâl′ (Y.), (LL.), Symphoricarpos racemosus.
Bul-luk′-tō (Co.), Micromeria chamissonis.
But″-chō′-ā (Yo.), (P.), Angelica sp.
But″-zä′-zä (P.), Heteromeles arbutifolia
Chā′-ā (Y.), Cercis occidentalis.
Ch'a″-ak′ (Y.), Asclepias eriocarpa.
Chä-bä′ (LL.), Corylus californica.
Chä-bä′ (P V.), (LL.), (Yo.), Juncus effusus.
Chä-lä′ (W.), Wyethia longicaulis.
Chäl-choi′ (Y.), Micrampelis marah.
Chä-öm′ (LL.), Pinus ponderosa.
Chä-wâ′-kot″-sâ (Yo.), Asclepias mexicana.
Chē-bä′ (P.), Achyrachaena mollis.
Chē-dä′ (Yo.), Blepharipappus platyglossus.
Chē-wish′ (Y.), Iris douglasiana.
Chi-en′ (Y.), Angelica sp.
Chi-läm′ (LL.), Wyethia longicaulis.
Chin-dun″-gä′-chit (W.), Thalictrum polycarpum.
Chin-sök′ (W.), Sambucus glauca.
Ch'kī (W.), Corylus californica.
Choi′-ē pots (Y.), Trifolium ciliolatum.
Ch'o′-mel (Y.), Achyrachaena mollis.
Chou′-mē-ō (Co.), Heracleum lanatum.
Chū-ös′ (Y.), Quamasia leichtlinii.
Chwâk (Yo.), -stick.
Da-cal′ bö (LL.), Hookera coronaria.
Dä-shā′ (P.), Madia dissitiflora.
Del′-shit (W.), Pinus sabiniana.
Dē-sä′ kä-lā′ (P.), Aesculus californica.
Dē-wish′-ä-lum (Yo.), Wyethia longicaulis.
De-wish′-ä-mä (PV.), (LL.), Cynoglossum grande.
Di-kö′-shö (W.), Rhamnus ilicifolia.
Dis-tā′-tsi (Co.), Arbutus menziesii.
Dop (Co.), Cercis occidentalis.
Dos (N.), Pteridium aquilinum.
Do-slū-tit′-is-dō (Yo.), Eschscholtzia douglasii.

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[1] See key at end of list.

Dos-sil′ (P.), Madia densifolia.
Dots-chăng′-she-bog-i̦ (W.), Trichostema lanceolatum.
Dū-shĕ′ kă-lā′ (LL.), Quercus californica.
Ek (LL.), Mentzelia laevicaulis.
Ē-wĕ′ bŭch-ō′-ȧ (Yo.), Thalictrum polycarpum.
Ē-wĕ′ shi-shä′ (LL.), Thalictrum polycarpum.
Fä-hut′ (Y.), Quercus lobata. (Galls.)
Făr′-sŏkt (N.), Aesculus californica.
Foin′-kā (Y.), Arbutus menziesii.
Gā-lä′ (Yo.), Hemizonia luzulaefolia.
Gă-lăm′ (Yo.), Fraxinus oregana.
Ga-lū′ bu-kī′ (LL.), Sambucus glauca. (Berries.)
Gă-sēl′ (Yo.), Sequoia sempervirens.
Gă-shă′ (LL.), (C.), Quercus chrysolepis. (Acorn.)
Gä-shēt′-i (P.), Alnus rhombifolia.
Gol-lĕ′ (Y.), Ribes californica.
Gol-lĕ′ (Y.), Rubus vitifolius.
Gōm′-he″-ni (Co.), Corylus californica.
Gōn′-chä (W.), Triteleia laxa.
Gos (W.), Libocedrus decurrens.
Gos′-chū (W.), Chlorogalum pomeridianum.
Gos′-ē-zi sō (P.), Aralia californica.
Gō-shin′ (Y.), Claytonia perfoliata.
Gos′-i (Co.), Prunus subcordata.
Gō-tō′-lä (LL.), Asclepias eriocarpa.
Hä′-hä (Co.), Quercus densiflora. (Acorn.)
Hân′-li (Y.), Philadelphus gordonianus.
Hĕ′-bē (Co.), Ceanothus integerrimus.
He′-tē (Yo.), Micrampelis marah.
Hī (P.), "The wood for."
Hī chä-hä′ kă-lā′ (P.), Datisca glomerata.
Hī-gat′ (Y.), Agaricus campestris.
Hit (W.), Ceanothus cuneatus.
Hī-wät′ (Y.), Lonicera interrupta.
Hō (P.), fire.
Hō bō (Yo.), Hesperoscordum lacteum.
Hō-dim′ (Yo.), Limodorum giganteum.
Hoi-ōnt′ (Y.), Quamasia leichtlinii.
Hoi′-tā (Co.), Psoralea macrostachya.
Hōl′-gă-shēn (Y.), Thalictrum polycarpum.
Hon′-shöl (Co.), Quercus californicus. (Acorn.)
Hö′-pē (Y.), Blepharipappus platyglossus.
Hō-sä′ kă-lā′ (Yo.), Cerasus demissa.
Hō-sä′ kä-lā′ (Yo.), Rhamnus californica.
Hös″-ä′-sisht (Y.), Daucus pusillus.
Hö′-tä (Co.), Libocedrus decurrens.
Hö-yō-con′-el (Y.), Eschscholtzia douglasii.
Hun″-möl′-ish, ( ), Dodecatheon hendersoni.
Ink-ō′-um (Y.), Platystemon californicus.
Jä-gilt′ (N.), Trifolium obtusiflorum.
Jä-jin′-jū (W.), Fritillaria mutica.
Jē′-jē (Y.), Quercus chrysolepis. (Acorn.)
Jesh (Y), Quercus chrysolepis. (Acorn.)
Je-snä′-ti (W.), Sanicula tuberosa.
Je-tsā′-chit (W.), Orthocarpus lithospermoides.
Jin-net′ (N.), Calandrinia elegans.
Jou′-lish (Y.), Collomia grandiflora.
Jou′-lish fal (Y.), Polypodium californicum.
Jou′-lish fal (Y.), Lathyrus watsoni.
Jū′ (W.), Pinus sabiniana. (Gum.)
Jus-ki-at′ (W.), Alnus rhombifolia.
Kā′-ā bö (P.), Sanicula tuberosa.
Kä-bä′-tä (LL.), Quercus douglasii. (Acorn.)
Kab′-it (Yo.), Arbutus menziesii.
Kä′-blū (Yo.), Artemisia heterophylla.
Kä bö (LL.), Sagittaria latifolia.
Kä-däch′-käch″-dō (Y.), Dodecatheon hendersoni.
Kä′-ē (Y.), Agaricus sp.
Kä′-hē (Yo.), Tumion californicum.
Kä-hōm′ (P.), Carex barbarae.
Kä-kō-chē-pēl′ (C.), Linanthus ciliatus.
Kä-kūl′ (Yo.), Quercus douglasii. (Acorn.)
Kä′-kus (W.), Philadelphus gordonianus.
Kä-lā′ (Yo.), Tree.
Kä-lā′ ä kä-lā′ (Yo.), Cercis occidentalis.
Kä-lā′ bö (P.), Calochortus pulchellus.
Kä-lā′ chā′-ā (C.), Polyporus sp.
Kä-lā′ kö′-chē (LL.), Alsia abietina.
Kä-läl′-nō (Yo.), Salix argyrophylla.
Kä-lā′ shā (Yo.), Pseudotsuga mucronata.
Kä-lā′ sō (P.), Trifolium ciliolatum.
Käl′-ē (Y.), Rosa californica.
Kal′-kä tzä′ (Yo.), Lathyrus watsoni.
Kä′-op (Y.), Bromus marginatus.
Kä-pä′ shō′-pä (P.), Helenium puberulum.
Kä sō (P.), Trifolium wormskjoldii.
Kā sō lök (P.), Trifolium obtusiflorum.

Kä-tsak′-ū (W.), Mentzelia laevicaulis.
Kä-wä′ (LL.), Pinus sabiniana. (Pitchy exudation.)
Kē-bē′ (P.), Tumion californicum.
Kē-chil′ wä-ē-mōk′ (Y.), Croton setigerus.
Kē′-gus (W.), Zygadenus venenosus.
Ket′-en (W.), Quamasia leichtlinii.
Ket′-en chou (W.), Quamasia leichtlinii (Valley where it grows.)
Kē-wē′ (Y.), Sambucus glauca.
Kē-wē′ mäm (Y.), Sambucus glauca.
Ki-kä′-hī-um (LL.), Trillium sessile giganteum.
Kin″-göt-gō′-sä (Y.), Lomatium utriculatum.
Kin-göt-gō′-sä (Y.), Tellima affinis.
Kit-tä′ (C.) (P.V.) (LL.), Sambucus glauca.
Kit-tä′ bu-kī′ (C.) (PV.) (LL.), Sambucus glauca. (Berries.)
Kī′-yä (LL.), Arbutus menziesii.
Kī-yäm′ (Y.), Quercus lobata.
Kī-yäm′-pō-ē, Arctostaphylos tomentosa.
Kī-yī′ (Yo.), Heteromeles arbutifolia.
Kī-yī′ (Yo.) (LL.), Arctostaphylos manzanita.
Kī-yī′ bu-kī′ (Yo.) (LL.), Arctostaphylos manzanita. (Fruit.)
Kī-yī′ chō-pä′ (Yo.) (LL.), Arctostaphylos manzanita. (Leaves.)
Klū-pö (N.), Salvia columbariae.
Kō′-bē (P.), Tumion californicum.
Kō-bī′-yē (P.) Allium. (Cultivated onion.)
Kō-bī′-yē (P.), Allium unifolium.
Kochk (Y.), Plagiobothrys campestris.
Koi-ē′ kä-lä′ (LL.), Lupinus carnosulus.
Koi-ē′ kas′-il (Y.), Hordeum murinum.
Koi-ē′ kas′-il (Y.), Sitanion elymoides.
Komp′-lū″-li (P.), Artemisia heterophylla.
Kō-ō′ chā′-ä (C.), Boletus sp.
Kō-öch′-ē (Y.), Arctostaphylos manzanita.
Kō-öch′-ē (Y.), Arctostaphylos tomentosa.
Kō-öch′ ök (Y.), Arctostaphylos manzanita. (Cider.)
Kop (Y.), Bromus marginatus.
Kop (N.), Vitis californica.
Kos-chet′-tsi (W.), Cercocarpus betuloides.
Kot-kä-yä′-chdō (Yo.), Helenium puberulum.
Kots′-tä (W.), Rhus diversiloba.
Kou-wät′-chu (Co.), Arbutus menziesii.
Kulk (Y.), Pogogyne parviflora.
Kus (W.), Alnus rhombifolia.
Lam′-chē, bulb similar to Quamasia leichtlinii.
Lat (Y.), Triteleia peduncularis.
Lēl′-mil (Y.), Trichostema lanceolatum.
Lēl′-mil (Y.), Godetia albescens.
Lēl′-mil (Y.), Scutellaria californica.
Lō-ē′ (Co.), Quercus lobata. (Acorn.)
Lol′ um (Y.), Juncus effusus.
Lōm (P.), Ribes californicum.
Lōm′ kä-lä′ (LL.), Crataegus rivularis.
Lōm kä-lä′ hī (LL.), Crataegus rivularis. (Wood.)
Mä (Y.), Apocynum cannabinum.
Mä be-hä′ yem (C.), Micrampelis marah.
Mä-chäl′ (Y.), Asclepias eriocarpa.
Mä-kō′ (P.), Hemizonia luzulaefolia.
Mâl-chū′-lēz (Y.), Delphinium hesperium.
Mâl-chū′-lēz (Y.), Lupinus carnosulus.
Mä-lē′ (Y.), Quercus garryana.
Mâl-ē-mē′ (Co.), Aralia californica.
Mâl-ē-mē′ (Co.), Petasites palmata.
Mä-lō′ mä-lō′, rude garment or cowty.
Mäm (Y.), berry.
Mä′-nä (Yo.), Matricaria discoidea.
Mä-ôr-dä-git′ (Yo.), Pteridium aquilinum.
Mäs (Y.), Zygadenus venenosus.
Mä-shä′ (LL.), Apocynum cannabinum.
Mä-stit′ (Yo.), Micromeria chamissonis.
Mât (Y.), Lolium temulentum.
Mä-tas′ sō (P.), Trifolium cyathiferum.
Mat′-ka (Yo.), Psoralea macrostachya.
Ma-tū′ (P.), doctor.
Ma-tū′-yä″-hō (P.), Rhus diversiloba.
Mē-ēn″-chip″-ä-soi′ (Y.), Lycoperdon.
Mē′-lē (Y.), Quercus douglasii. (Acorn.)
Milk (Y.), Quercus douglasii. (Acorn.)
Mil-kō′-chē (Y.), Heteromeles arbutifolia.
Mū-lä′ (LL.), Cercis occidentalis.
Mom (Y.), Quercus californica.
Mōn-sin′ (Y.), Carum kelloggii.
Mon′-uk (N.), Solanum nigrum.
Mōt-mō′ mäm (Y.), Vitis californica. (Fruit.)
Mul′-cōm (Y.), Petasites palmata.
Mūl′-sik (Y.), Trifolium cyathiferum.
Mun′-shōk (Y.), Heracleum lanatum.

Mū-sē′-päl (P.), Boisduvalia densiflora.
Nä-kä (Yo.), Pinus sabiniana.
Nä-kä′ (Yo.), Pseudotsuga mucronata.
Nä-tit′-nēs (W.), Pinus lambertiana.
Nī′-ē (Y.), Lomatium utriculatum.
Nin-kōs′-jē (W.), Cerasus demissa.
Nok (Y.), a large mussel shell.
Nō-kōm-hē-in′-ē (Co.), Sambucus glauca.
Nōsh (Y.), Chlorogalum pomeridianum.
Nū (Y.), Pseudotsuga mucronata.
Nū fal (Y.), Pseudotsuga mucronata. (Leaves.)
Nun (Y.), Quercus californica.
Nun-ält′-mil (Y.), Achillea millefolium.
Nun-fat′-ē (Y.), Linanthus ciliatus.
Ōl-gät′-i (Y.), Evernia vulpina.
Ōl-lō′-bich (Y.), Thysanocarpus elegans.
Ōl mäm (Y.), Corylus californica.
On-pōt′ (Y.), (LL.), (Co.), Carex sp. (Roots.)
Ō′-pē-ōl (Y.), Rumex crispus.
Pä (Co.), Rhamnus californica.
Pä-gōt (N.), Arcstostaphylos manzanita.
Pä-hut′ (Y.), Pinus lambertiana.
Pâl′-but (Y.), Platystemon californicus.
Pal-gōn′-shē (Y.), Acer macrophyllum.
Pä′-ōnsh (Y.), Quercus lobata. (Bread from.)
Pä-shō′-lä (Yo.), Trifolium dichotomum.
Pät′-mil (Y.), Populus fremontii and P. trichocarpa.
Pē-ni-mē′ (Y.), Trifolium variegatum.
Pē″-ni-pēn-sik′ (Y.), Trifolium wormskjoldii.
Pē′-wē (Co.), Petasites palmata. (Root.)
Pō (Co.), Apocynum cannabinum.
Pō (Co.), Rhamnus californica.
Pod″-jez-pâl-mök′ (Y.), Vicia americana.
Pōk (Y.), Fraxinus oregana.
Pō-lä′-ä (Y.), Monardella sheltonii.
Pōl′-cum (Y.), Umbellularia californica. (Nuts.)
Pōl′-cum hōt′-mil (Y.), Umbellularia californica. (Bread made from nuts.)
Pōl′-cum ōl′ (Y.), Umbellularia californica.
Pōl′-cum ōl (Y.), Pinus sabiniana.
Pol-put′ mäm (Y.), Fragaria californica.
Pō-mä′ mäm (Y.), Cerasus demissa.
Pō′-muk (Y.), Anthemis cotula.
Pots (Y.), Clover.
Sä-cōm′ (Y.), Trifolium wormskjoldii.
Sä-cōm′ (Y.), Trifolium obtusiflorum.
Sä-kä′ (Y.), Nicotiana bigelovii.
Sä-kä′ hī (P.), Symphoricarpos racemosus.
Sä pots (Y.), Trifolium bifidum decipiens.
Sä′-tek (LL.), Eriodictyon californicum.
Sē-äm′ (P.), Salix lasiolepis. (Inner bark of.)
Sē′-hil (Y.), Elymus triticoides.
Sel-säs′-chō (W.), Pedicularis densiflora.
Sē-pä′ (LL.), Quercus lobata. (Acorn.)
Sē-ū-didl′-ä (W.), Sanicula menziesii.
Shä bō (P.), (Yo.), Lomatium utriculatum.
Shä-bō′-tä (P.), (Yo.), Carum kelloggii.
Shâ-lē′-kō-em (Y.), Razoumofskya occidentalis.
Shä-mut′ (P.), Madia dissitiflora.
Shân-lē′ (Y.), Libocedrus decurrens.
Shân-tum′ (Y.), Equisetum variegatum.
Shast-kēt′-ä (W.), Rhamnus californica.
Shä-tä′-ē (LL.), Bromus marginatus.
Shä′-um (P.), Croton setigerus.
Shä-wä-kä′ (LL.), Vicia americana.
Shēp (Y.), Allium bolanderi.
Shēp (Y.), Allium unifolium.
Shē-in′ (P.), Vitis californica.
Shē-nâ′-tik (P.), Grindelia sp.
Shkä (Yo.), Salix lasiolepis.
Shlâ (N.), Chlorogalum pomeridianum.
Shmū (Yo.), Ear.
Shmu-chwâk′ kä-lä′ (Yo.), Adiantum emarginatum.
Shō′-kish (Y.), Quercus densiflora. (Acorn.)
Shōn′-a-hī (LL.), Philadelphus gordonianus.
Shō-pä′ (Yo.), Leaf.
Shū′-âl (Y.), Cynoglossum grande.
Shūk′ōl (Y.), Pinus lambertiana.
Shū′-mē (LL.), Equisetum variegatum.
Shu-töt′ (W.), Pinus lambertiana. (Sugar.)
Sic (Y.), Trifolium virescens.
Sī kä-lä′ (P.), Butneria occidentalis.
Si-lim′ (P.), Iris douglasiana.
Si-lim′ mä (Yo.), Apocynum cannabinum.
Sī-mē′-yä (Yo.), Avena fatua.
Sī-mē-yä hō (Yo.), Avena fatua. (Flour.)
Sī′-tō (W.), Juncus effusus.
Skin′-chōn (W.), Quercus lobata. (Acorn.)
Skut-in′-jet (W.), Daucus pusillus.

Sō (P.), Clover (or, more generally, any plant whose leaves are satin green).
Sō-ē′-bä (Co.), Umbellularia californica.
Sō-mä′ (C.), Delphinium nudicaule.
Sō-mä′ yem (C.), Delphinium nudicaule. (Root.)
Spö kä-lā′ (Yo.), Juniperus californica.
Stū-stū′-lä (Yo.), Pedicularis densiflora.
Sū-lä-lä′ (Co.), Pteridium aquilinum.
Sympt′-ōl (Y.), Aesculus californica.
Tal'k (Co.), Cercis occidentalis.
Tä-loch′-dō (Yo.), Ranunculus eisenii. (Seed.)
Tä-nē′ (Co.), Pinus sabiniana.
Tä-rä-tit′ (Yo.), Ribes californicum.
Tä-rä-tit′ (Yo.), Heracleum lanatum.
Tä′-sha-lē (LL.), Eschscholtzia douglasii.
Tä-tä-tē′ (Co.), Petasites palmata.
Tâ-tet′-el (W.), Carex sp.
Tē (Y.), Carex vicaria.
Tē-lä′ (P.), (LL.), Ranunculus eisenii. (Seed.)
Tē-lä′ (P.), (LL.), The tick.
Tē-lā′bö (LL.), Triteleia laxa.
Tel-dink′-ō (W.), Petasites palmata.
Te-nis″-tâ (W.), Arctostaphylos tomentosa.
Tē-täm′ kä-lā′ mäm (Y.), Rubus leucodermis.
Til-at′-mil (Y.), Eriodictyon californicum.
Ti-ti-mē′ (LL.), Rubus vitifolius. (Vine.)
Ti-ti-mē′ yem (LL.), Rubus vitifolius. (Root.)
Tol (W.), Quercus californicus. (Acorn.)
Tō-nē′ (LL.), Porphyra laciniata.
Tom′-tē bō (P.), Calochortus maweanus.
Tsī mä-är′-shē (LL.), Phoradendron flavescens.
Tsin (P.), Zygadenus venenosus.
Tso″-tä-tä-sit′-chō (W.), Eschscholtzia douglasii.
Tsū-ish′ (P.), Carex sp.
Tun′-ti (Y.), Rhamnus californica.
Um′-pē (Y.), Rhamnus californica.
Un′-sē (Y.), Alnus rhombifolia.
Un′-gā-mil (V.), Madia dissitiflora.
Wä-chä′ (W.), Mimulus guttatus.
Wä-chōk′ (Y.), Quamasia leichtlinii.
Wä-i-mök′ (Y.), Pedicularis densiflora.
Wân-kö-mil′-ē (Co.), Rubus vitifolius. (Vine.)
Wä′-sā (Co.), Rubus parviflorus velutinus.
Wä-sä-got′-ō (Co.), Eriodictyon californicum.
Wē (Y.), Ranunculus eisenii.
Wen (Yo.), Datisca glomerata.
Yä (P.), South.
Yē-hō′ (Yo.), Achyrachaena mollis.
Yē-mā-doṣ′-il-slū (N.), Anthemis cotula.
Yōl′-kō (Co.), Taxus brevifolia.
Yūk (Y.), Ceanothus cuneatus.
Yūk-kuml′ (Y), Ceanothus cuneatus. (Flowers.)
Zhâl-zhoi′-ē (Y.), Trillium sessile giganteum.
Zhâl-zhoi′-ē (Y.), Micrampelis marah.
Zhe-lä′-tsā″-chit (W.), Iris douglasiana.

KEY.

C=Calpellas.
Co=Concow.
LL=Little Lake.
N=Numlaki.
P=Pomo.
PV=Potter Valley.
W=Wailaki.
Yo=Yokia.
Y=Yuki.

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